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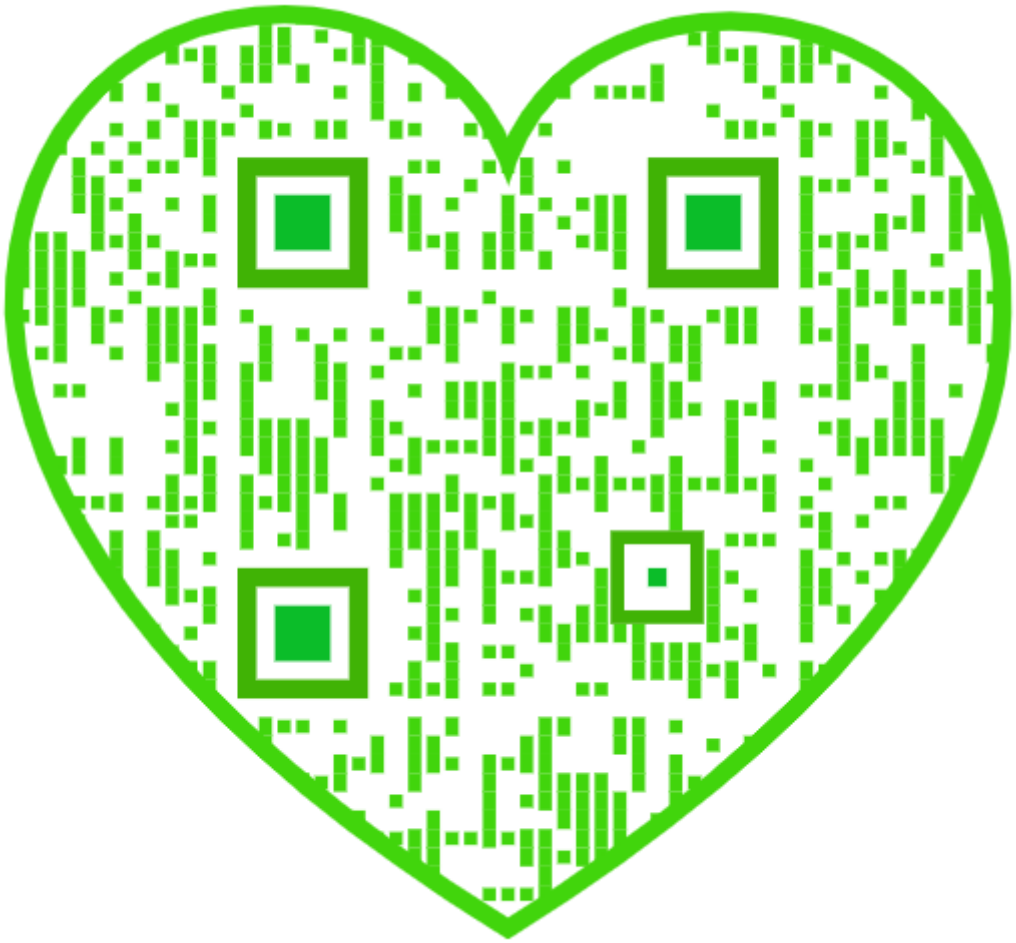


SCIENTIFIC AMERICAN

A WEEKLY JOURNAL OF PRACTICAL INFORMATION, ART, SCIENCE, MECHANICS, CHEMISTRY, AND MANUFACTURES.

Vol. XXXVIII.—No. 1. [NEW SERIES.] NEW YORK, JANUARY 5, 1878. [$3.20 per Annum. [POSTAGE PREPAID.]

Utilization of the Heat of the Sun.

The other day a trial was made, in the presence of several gentlemen, including representatives of the press, of Mr. Adams' patent solar cooking apparatus; and the result was pronounced to be highly satisfactory. The compound of the High Court was the place selected for the experiment.

At 11 o'clock in the forenoon the apparatus was so placed in the open air as to receive the solar rays, and about every half hour its inclination was changed by a touch of the hand. About 4 o'clock in the afternoon the apparatus was removed from the spot and placed in a room, covered with a railway rug. At 8 P.M., when the cover and the rug were removed, the contents (several pounds of mutton and some vegetables were found thoroughly cooked.

We should not omit to mention, that the stew, which proved to be most palatable to those who partook of it, was found to be quite hot, while the vessel could hardly be touched by the naked hand.

The apparatus, we may state, consisted of a copper vessel tinned inside and painted black outside, with a glass cover enveloping the vessel with an inch of hot air.

The solar rays, passing through the glass, we were told, became transformed into obscure heat which the glass retained. The vessel was fixed on to the bottom of a conical reflector lined with common silvered sheet glass, and was 21 inches square at its large base and 8 inches at its small base.

Mr. Adams has made another apparatus of greater simplicity than the one experimented upon, which, by means of solar rays, and in the open air, can cook chops and steaks as well and as expeditiously as over a coal or coke fire. A very important point is that the heat can be retained as long as three hours and a half, and perhaps longer. Mr. Adams hopes soon to be able, under more favorable circumstances than at present, by means of an apparatus constructed on the same principle, and by a combination of flat reflectors, to concentrate solar rays to such a degree as to work wonders in science yet undreamt of. —*Times of India.*

A New Cement.

Mr. Emlen T. Littell, in the *American Architect*, says the following formula for cement has been very successfully used. The product is of very great strength; and the materials may be obtained where other cement cannot: 1 heaped bushel of mortar made in the usual way for brickwork, add 3½ quarts of iron scales, 1½ quarts of molasses; to be mixed in these proportions in quantity that can be used the same day.

Cremation in Italy.

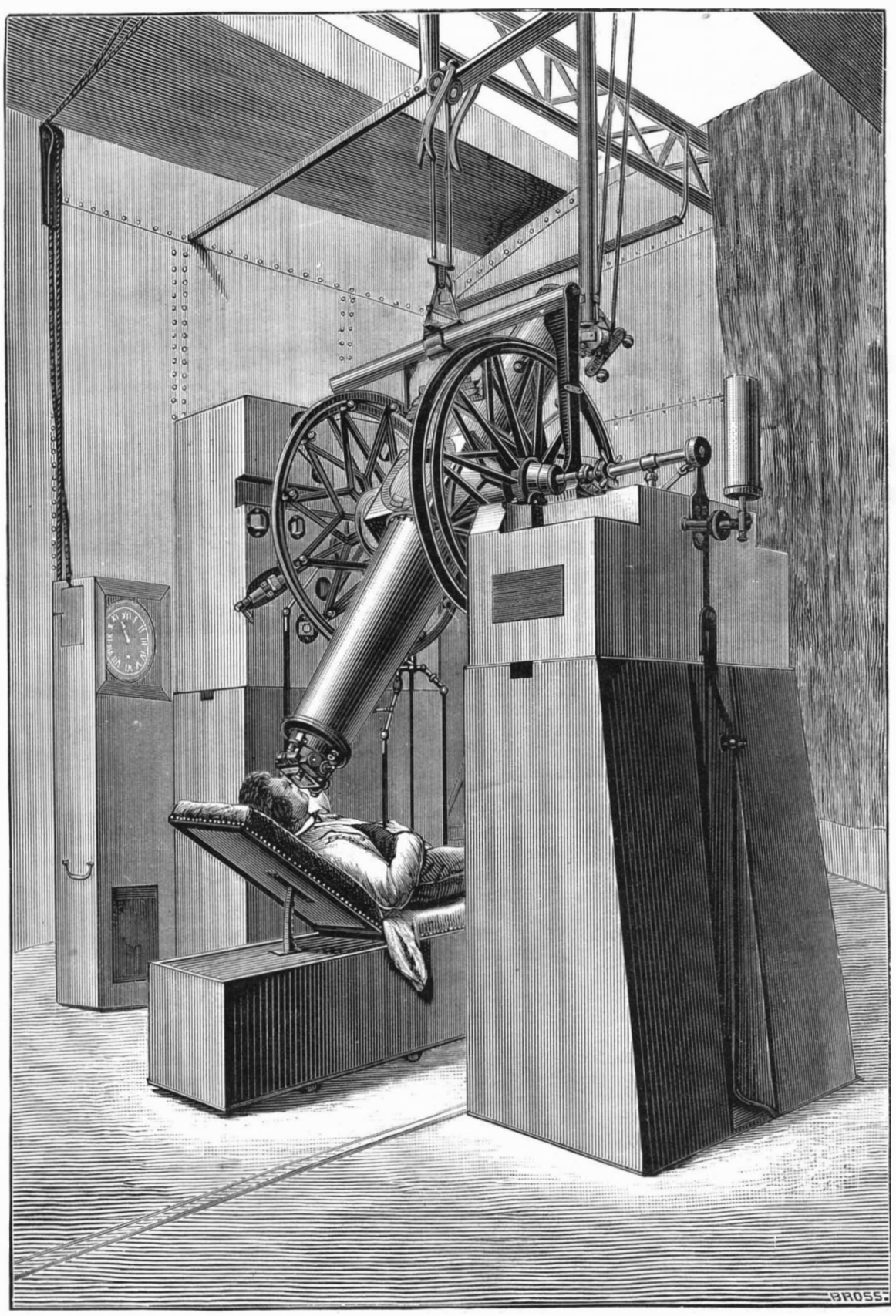
The *Lancet* says that on the 9th of October, at the cemetery of Riolo at Lodi, Professor Gorini made a new trial of the crematory apparatus invented by himself. There were several distinguished persons present, among them Dr. Bono who was delegated by the Council of Milan; Dr. Nardi, also of Milan; and the representatives of the leading Italian papers, professional and lay. The number of army surgeons in attendance was also remarked. The body destined for cremation was that of a man, sixty-two years of age, and weighing forty-two kilogrammes. It was introduced into the apparatus at 1 P.M. At 3 P.M. the fire had done its work, and there remained of the body only 5 per cent of its original weight. Not the slighest fetor or disagreeable sensation was experienced by the bystanders. This result was obtained with the consumption of two hundred kilogrammes of wood. A round of applause saluted Professor Gorini, and, in the name of the company, Dr. Bono congratulated him on having produced the most expeditious and thorough crematory apparatus yet known.

Test for Alkali.

As a substitute for ordinary test paper, Dr. E. Luck draws attention to a new substance, phenol-phtaleïn, which may easily be prepared by heating phenol with phtalic anhydride and concentrated sulphuric acid. This body is entirely colorless in neutral or acid solutions, but exhibits an intense purple color in the presence of the least excess of alkali. The change of color is instantaneous, and its depth intense, so that even mere traces of the indicator and of an alkali become recognizable.

THE MERIDIAN CIRCLE IN THE PARIS OBSERVATORY.

The annexed engravings, which we extract from *La Nature*, represent the new meridian circle recently presented to the observatory of Paris, by M. Raphael Bischoffsheim. The apparatus consists of two instruments, the transit circle, Fig. 1, by means of which and an astronomical clock the observer is enabled to determine the time transit of a star across the meridian of the plane of observation, and the mural circle, Fig. 2, which measures the angular distance of the same star from the pole or zenith. Instead of being constructed of rolled brass, connected by simple brazing or screw-threading, the bodies of these magnificent instruments are formed of cast iron attached to axes of steel. The bronze circles are cast in a single piece, and by numerous cross ribs are guarded against any possible deformation.



THE MERIDIAN CIRCLE IN THE PARIS OBSERVATORY.—Fig. 1.

The following brief description will afford an idea how these instruments are used. A few minutes before the passage of the star to be observed across the meridian, the astronomer directs the tube of his transit apparatus, so that the star may apparently travel over its field. To this end the interior circles fixed to the axis of the instrument have a coarse graduation. The observer then places himself as shown in Fig. 1. When the star enters the field of view the observer notes the second and fraction thereof of time at which the star passes each of the spider lines in the instrument. The mean of these noted times is the moment of passage over the middle thread or meridian. Ordinarily the transit instrument contains either five or seven threads, all at equal intervals. While the observer is noting the progress of the star across the transit threads, he at the same time, by a delicate adjustment of the telescope in altitude, places it so that the star appears to run along a fixed horizontal thread; and then, the transit observation having been completed, he reads even to the fraction of a second, from the circle microscopes, the precise point corresponding to the altitude of the star.

In this manner the right ascension and declination (corresponding to the geographical longitude and latitude) of the heavenly body are obtained and its absolute position thus fixed.

The instrument must, of course, be accurately adjusted in the meridian of the place of observation. It must be perpendicular to the horizontal axis about which it turns, and the plane in which it moves in passing around

[*Continued on page* 4.]

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NEW YORK, SATURDAY, JANUARY 5, 1878.

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V. CHEMISTRY AND METALLURGY.—On the Protection from Atmospheric Action which is imparted to Metals by a coating of certain of their own Oxides respectively. By JOHN PERCY.—Coating plates of Metal.—On the Action of Various Fatty Oils upon Copper. By WILLIAM HENRY WATSON, F.C.S. A paper read before the British Association.—Detection of Fatty Matters fraudulently introduced into Butter. By C. HUSSON.—Experiments on the Formation of Ultramarine. By M. J. F. PLICQUE.—Action of Cyanogen on Albumin.—Freezing point of Ether. By A. P. N. FRANCHIMONT.—A New Series of Acid Salts. By A. VILLIERS.—Presence of Benzene in Coal Gas.—By M. BERTHELOT.—Metanethol Camphor. By P. PERRENOUD.—Extraction of Caffeine. By LEGRIP and PETIT.—Coloring Matter of the Petals of Rosa Gallica. By HAROLD SENIER.—Zinc in Animals and Plants. By G. LECHARTIER and F. BELLAMY.—Saccharifying Ferments. By J. SEEGEN and KRATSCHMAR.—Detection of Alum in Flour. By J. C. BELL.—Estimation of Piperine in Pepper. By CAZENEUVE and CAILLOL.—Winter Coloring of Leaves. By G. HABERLANDT.—Influence of Cold on Milk.

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VI. NATURAL HISTORY, GEOLOGY, ETC.—Notes on the Botany of the Rocky Mountains.—Human Stature.

VII. AGRICULTURE, HORTICULTURE, ETC.—Suggestion for Winter Strawberries.—To destroy Chicken Lice.—Cheap Greenhouses.—Labor-saving Cows, 1 illustration.—Hop Culture in New York. By EMERY GILBERT BISSELL.—Varieties of Hops; best conditions of Growth; destructive Insects, and Hop Blight or Rust. Cost and Profit. Statistics, etc.—Cost of Raising Potatoes.—Advantage of Drainage proved. How to save Expense in Planting. Subsequent Cultivation. Varieties of Potatoes, etc. Excellent suggestions.

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CURIOUS HYDRAULIC EXPERIMENTS.

A disagreement recently occurred in Germany between the Government and a number of manufacturers relative to the classification of certain water courses used by the latter for power purposes. Among other questions was one which involved the determination of the source of the waters of the Aach, the settlement of which was important as affecting the interests of the manufacturers and also from a purely scientific point of view. A French hydrographic engineer was charged with the work, and in his report is detailed the curious way in which the problem was solved.

The Danube River, proceeding from the Black Forest, flows nearly directly from west to east, while the waters of the Rhine move in parallel direction, but inversely, from Lake Constance to Bâle. The altitude of the two streams differs, the relative difference being about 800 feet, and the Danube, in the region referred to, being some 2,000 feet above the sea level. The distance separating the rivers is about 18 miles. The river Aach is a tributary of Lake Constance, and rises near the village of the same name, at a point 9 miles from the Danube and at an elevation some 500 feet lower than the level of the latter. The spring from which the Aach flows is one of the largest in Europe, and its yield is about 1,350 gallons per second. The Danube flows over a calcareous bed, the inclination of which is exactly the same as that of the ground from the Danube to the source of the Aach. The calcareous soil ceases beyond the above named source, and the bed of the river enters the alluvial earth which surrounds Lake Constance. The limestone of the Danube Valley is composed of irregular layers diversely inclined, very friable, stratified, split and divided. The soil is so permeable that it absorbs the greater number of the springs and streams which rise between the Aach and the Danube.

For many years it has been noticed that the Danube loses a portion of its water in this region, and that during dry seasons even the greater part of its flow disappears in crevices or veritable holes in its bed. The owners of factories situated on the Danube, in order to retain their water supply, stopped up these leaks, but in so doing they were at once opposed by the manufacturers whose works were located on the Aach, the latter claiming that the water lost by the Danube fed the Aach, and to check the waste from one river to the other was to interfere with their just enjoyment of the smaller stream. The question, however, was to prove that the assertion of the Aach manufacturers was a true one, namely, does the water from the Danube, by some subterranean infiltration, supply the Aach, located as already stated 9 miles away?

The first plan suggested was to make the Danube water salt. This was proposed by Professor Knop of Karlsruhe, and accordingly 22,000 lbs. of salt were placed in a hole in the bed of the great river. Then water from the source of the Aach was obtained every hour for several days, and this on being analyzed revealed the presence of the salt.

In order to get still better proof, M. Ten Brink decided to take advantage of the wonderful coloring power of fluorescine. This substance is the phtaline of the resorcine obtained by treating at 374° Fah. a mixture of phtalic acid and resorcine. Its formula is C^{20} H^{12} O^5, according to the equation of its formation C^8 H^4 O^6 (phtalic acid)+2 (C^6 H^6 O^2) (resorcine)=C^{20} H^{12} O^5 (fluorescene). It is the first of a series of superb coloring matters, according as there is introduced into its constitution bromine, iodine, or chlorine, and its coloring power is so great that 1 part of fluorescine in 20,000,000 parts of water is quite sufficient to be recognized.

On the 9th of October last, at 5 o'clock in the afternoon, fifteen gallons of a solution of fluorescine were thrown into one of the orifices in the bed of the Danube. On October 12, the observers stationed at the source of the Aach observed the coloration of the water. It had, therefore, taken about 60 hours for the colored water to traverse the soil and reappear. It is stated that the Aach as it gushed from its springs presented a magnificent intense green, which in the sun exhibited more or less fluorescent reflections ranging from light green to brilliant yellow. The intensity of the dye augmented from morning until evening of October 12. Its effects were quite visible until about 3 P.M. on the 13th, when it gradually disappeared.

The experiment was certainly a most remarkable one. Its repetition in other localities may prove of great value in the study of subterranean water courses, while it offers a new method of geological investigation worthy of general attention

THE PARIS EXPOSITION.

The bill appropriating $150,000 for the purposes of our representation at the Paris Exposition, and providing for the appointment of twenty assistant commissioners at $1,200 each, in addition to the Commissioner General, has at length, after amendment by the Senate, passed the House of Representatives. Our participation in the show thus being secured, the work of official preparation and organization is now being rapidly pushed forward. Ex-Governor McCormick has been appointed Commissioner General. The assistant commissioners have not yet been named, but they will be designated by the President, under advice of the Secretary of State. Over 700 applications for these positions have already been received. The appointments are allotted among the different States, and also among the various business interests which it is desired to have officially represented, so that the selection of these gentlemen will be made from among the most prominent names in the country. A number of honorary commissioners are also to be appointed.

Offices of the American Commission will soon be opened in New York, Philadelphia, and Washington. Three United States vessels will transport the goods for exhibition, namely, the Supply, 750 tons freight capacity, to sail from New York February 1; the Constitution, 1,200 tons, to sail February 15; and the Wyoming, of 250 tons, to sail March 1. We are informed that some 800 cases of American goods are all ready for shipment. The French Minister at Washington has also given assurance that the time fixed by the regulations of the Exposition for the allotment of space will be extended in favor of American exhibitors. The arrangement of the American section will, it is stated, be confided to Mr. Henry Pettit, late superintending engineer of the Centennial Buildings, now in Europe. The headquarters of the Commissioner General in New York are in room 24, Post Office building. He proposes to sail for Europe about March 1. It is hardly necessary to add that those of our readers who intend taking advantage of the facilities offered for dispatching contributions should lose no time in completing their preparations, as a large number of intending exhibitors, who have been holding off to see whether Congress would make the appropriation or not, are now rapidly sending in their exhibits, so that it seems probable that the accommodations in the vessels mentioned will not suffice to meet all the demands.

RUBIES AND SAPPHIRES, ARTIFICIALLY PRODUCED.

MM. Fremy and Feil have recently exhibited to the French Academy of Sciences some magnificent specimens of crystallized silicates, and of corundum, which substances form the basis of the so-called oriental gems, notably rubies and sapphires. The process consists in heating to a red heat for a long period a mixture of aluminate of lead and of silex. Some sixty pounds of these ingredients were treated for twenty days in a glass furnace. The aluminum disengaged little by little, and thus colorless corundum was produced. To this was added 2 or 3 per cent. of bichromate of potash, the material then assuming the color of the ruby, while the addition of oxide of cobalt produced the sapphire. It is stated that in density, hardness, brilliancy, color, and even, as M. Janettaz has discovered, in crystallographic and optic properties, these artificial gems exactly coincide with the natural ones. The crystals exhibited are not microscopic, as were those which have resulted from similar efforts to produce jewels by chemical means—but on the contrary are large enough to be cut by lapidaries and to adapted for watch-making. The discoverers do not intend to patent their process, which was the result of a purely scientific investigation, but give it freely for any industrial uses to which it may be applied.

THE EDUCATION OF A CIVIL ENGINEER.

In an address on the education of a civil engineer Mr. C. Graham-Smith, of Edinburgh, gives much valuable advice, which by slight changes can be made of much use in this country. The term engineer has a very extended application; it includes, among others, men who drive locomotives, attend to the engines of steamboats, look after gas and water arrangements, design and put together mill gearing and machinery of every description, besides those who study it more particularly as a science. It is useless, therefore, to attempt to define an engineer.

Ambition and hope, combined with a strict sense of duty, are necessary antidotes to the self-denial and hardships required to be gone through in endeavoring to overcome all difficulties to be met with in the engineering world; for it must be borne in mind that the word impossible has long been banished from the engineer's vocabulary. Engineers may at any moment be called upon to carry out any of the following works: Railways, roads, canals, docks, piers, breakwaters, landing stages and other harbor works, water, sewage, and gas works. Numerous others of equal importance might be given. In the first instance the engineer will probably be required to report on the project, looking at it from an engineering, and perhaps financial, point of view, and generally to prepare preliminary plans and estimates. More accurate plans, levels and estimates must afterwards be made, to be in turn superseded by the working plans and sections. In performing the foregoing, it will be necessary to have:

First, A sound constitution, proper mastership of his own language; the power of dealing with all classes of men, both individually and collectively, and the tact of readily ascertaining the merits and abilities of those whom it is thought of employing in various capacities in the carrying out of an undertaking.

Second, Command of those theoretical and practical sciences which bear on or affect his profession.

Third, A good mechanical training.

Fourth, A general knowledge of engineering works and special information for the carrying out of each class.

Fifth, The tact of ascertaining and arranging facts, as well as surveying, mapping, and calculations of all kinds.

Parents should fully consider the following questions before allowing a boy to think of becoming a civil engineer.

Is he physically and intellectually capable of undertaking the studies?

Is he possessed of the necessary foresight, self-denial, self-reliance, and indomitable perseverance?

After going through the ordinary high school system of education, he must be sent forthwith to a good mechanical works, to go through a regular pupilage, for it is a delusion to suppose that the requisite mechanical knowledge can be

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gained in the course pursued at some colleges. The pupil may object to menial duties, but it is necessary to do such things when told by the foreman, if only to gain their confidence. Providing he does his work accurately and moderately quickly, he will soon be asked to undertake more difficult work. The discipline exercised in the works, the thorough, systematic, and accurate way in which things are done, the strict attention to all small matters of detail, and the habit of punctuality acquired, will do much to form the character and fit the pupil for further pursuing his studies, conducting himself, and controlling assistants in after life.

On the termination of this mechanical apprenticeship he may at once become a student with a civil engineer, or he should go to some good scientific college. Care must be taken not to overtax the mind, and to keep the body in good physical training. The student may now be considered to have completed his preliminary training, but his education as an engineer will only be terminated by death.

NEW YORK ACADEMY OF SCIENCES.

A meeting of the Chemical Section of the New York Academy of Sciences was held Monday, December 10, at the Stevens Institute of Technology, Professor Newberry presiding.

DISCOVERY OF NEW ELEMENTS.

An important letter from Professor G. A. Koenig of the University of Pennsylvania was read, in which he makes the following communication: "I am engaged and have been for a considerable time past in a study of titanium. The investigation is one absorbing much time and the progress is very slow. My results hitherto obtained convince me that all natural Ti O_2 is capable of being separated into compounds yielding different reactions, and hence that titanium must be considered as composed of two metals at least, but I think three. The trimorphism of Ti O_2 led me into this investigation and will find finally its explanation in the above sense. I am unwilling however to publish partial results."

Professor Henry Wurtz of Hoboken exhibited some curious specimens of flint, whose density he had carefully determined and which he had thus found to contain the "opal molecule" instead of that of ordinary silica. He also exhibited a number of shells.

The first paper read was entitled Contributions from the Laboratory of the University of Minnesota, by Professor S. F. Peckham.

ANALYSES OF THE ASHES OF WHEAT BRAN.

A substance having the appearance of a vesicular limestone and stated to be the ash of wheat bran that had been placed under a boiler was analyzed by Miss Cora I. Brown in the University laboratory. It was of a uniform gray color, appeared to be completely fused and had a density of 2·34 and a hardness of 3½–4. Its composition was found to be

Potassium Chloride.....	K Cl	1·2887	per cent
" Silicate	$K_4 Si O_4$	2·5936	"
" Phosphate	$K_3 PO_4$	5·8337	"
Sodium "	$Na_3 PO_4$	11·7370	"
Hydrogen "	$H_3 PO_4$	9·3721	"
Calcium "	$Ca_3 P_2 O_8$	18·2342	"
Magnesium "	$Mg_3 P_2 O_8$	41·4600	"
Ferric "	$Fe_2 P_2 O_8$	3·8058	"
Calcium Sulphate.....	$Ca SO_4$	1·9567	"
Water (hygroscopic).....	$H_2 O$	·4379	"
Sand and insoluble residue.		3·1700	"
		99·8897	

The professor bestowed the highest praise upon the above determination by Miss Brown, as having been performed by the most accurate and skillful manipulator he ever had under his instruction.

ANALYSES OF GLAUCONITE.

An analysis was made of a species of glauconite imbedded in what is called the St. Laurence limestone, found at several points in the valley of the Minnesota river and quarried for a building stone. This is a hard silicious limestone containing sufficient iron to give it an ocherous shade of color with yellowish streaks. The glauconite is distributed through this rock in the form of small green grains which are obtained by dissolving the stone in hydrochloric acid and separating them from the undissolved quartz. Their composition was found to be: Si O_2, 48·20 per cent; Fe O, 27·09 per cent; $Al_2 O_3$, 6·94 per cent; $K_2 O$, 7·54 per cent; $Na_2 O$, 1·02 per cent; $H_2 O$, 8·72 per cent; total 99·51.

THE RUSSELL MINERAL SPRING.

The analysis of a clear and sparkling water of a slight greenish color and hydrosulphuric acid taste, taken from the cellar of a house in Minneapolis, proved it to contains $Ca CO_3$ $Mg CO_3$, NCl, $Ca SO_4$, Si O_2, $Mn CO_3$, Fe CO_3, Ca-Cl, KCl, $Ca_3 (PO_4)_2$, with traces of other substances, amounting in all to 19·065 grains in a gallon of 231 cubic inches. It has a temperature of 45·5° F., at which it contains 15·386261 cubic inches of free CO_2 in solution. The amount of $H_2 S$ varies from a trace to a few cubic inches per gallon. The reputation which this water has attained as a remedial agent may be in part due to the presence of the relatively large amount of calcium phosphate, or it may be due to the peculiar combination presented by the simultaneous presence of phosphate of lime, protocarbonate of iron and sulphide of hydrogen. It may be said, however, that the causes producing certain physiological effects are very obscure; and when these effects are observed to follow the use of complex mixtures dissolved in large quantities of water, but little satisfaction can be gained from theoretical speculations of one or the other ingredient of the mixture. But little more can be said than that the water contains small quantities of substances, that give, when found in large proportions, the specific characters to seltzer, chalybeate and white sulphur springs, and that its use in many instances has been attended with beneficial results.

The reading of the above paper was followed by illustrations of

SOME RECENT DEVELOPMENTS OF THE SINGING TELEPHONE,

by President Henry Morton. He described briefly a series of experiments made under his direction at the Stevens Institute by Messrs. Geyer, Beckmeyer and Ayres. Taking the mouthpiece of Reiss as a starting point, they tried a great variety of materials to receive the impulse of the voice, and finally concluded that the best results are produced with common note paper. To increase the volume of the sound received, sounding boards of musical instruments were tried and a guitar was found to be best adapted. The professor exhibited several telephones made on this principle. A strip of iron is cemented to the guitar and the poles of the magnet are placed opposite this strip and as near it as possible without actually touching. By the aid of a current from a very weak battery a tune sung in another room of the Institute was transmitted through half a mile of wire to the guitar receiver and became distinctly audible, filling the large hall without difficulty. The same effect is produced with an intermittent current from a coil and break circuit.

Professor Albert R. Leeds followed with a series of communications on the examination of drinking water.

RELATIONS BETWEEN FISH AND PLANT LIFE AND THE POTABILITY OF DRINKING WATER.

The subject of the wholesomeness of drinking waters was brought prominently before the public of this section by the excessive mortality of the fish in the Passaic river during last June. This appeared of such importance to the professor that he made two visits to Paterson to collect information. No naturalist appears to have examined into the nature of the disease. Its external indication was the formation of a soft spot on the side of the fish, and death speedily followed the rapid growth of this spot. That the refuse of factories was not the cause was plain from the fact that fish had died in great numbers above the Falls even in the tributaries of the Passaic, and also in isolated bodies of water like Rockland Lake. Mr. John Roe, one of the fish wardens, stated that the water was unusually low during the epidemic and the weather had been excessively hot. Where the disease was most prevalent, the depth of the water varied from 3 to 8 feet. It appeared also that at this time unusual amount of aquatic plants of a low order had invaded the stream. The following inferences may be drawn: 1. That the rapid development of vegetable growth may be attended with the production of spores or gemmicles forming a specific poison to fish life. 3. That the organic impurities arising from the action of the sun upon shallow water and the gases evolved may originate disease. 3. The supply of oxygen might fall below the point requisite to the support of life by being consumed in the oxidation of vegetable matter; by the partial exclusion of the air from the water by the crust of floating algæ; and by a diminution in the supply of highly aerated water from higher levels by reasons of the draught. A very heavy rain put an end to the epidemic. The third hypothesis seems the strongest. During the prevalence of the epidemic no complaint was made at Paterson, Newark, Jersey city, or Hoboken, in reference to the appearance, taste or smell of the water.

Disagreeable smells in water may be due to several lyngbyæ and oscillatoriæ which produce an indescribably suffocating odor; to some species of beggiatoa which emit a sulphurous exhalation; or to certain species of decaying nostocs, whose odor resembles that of the pig pen. These are oscillatoriæ which appear as bluish green masses on mud or shallow water. A thorough study of the fresh water algæ will be found of the utmost importance in the solution of the problem of water purification.

The "combustion process" is the best method of chemically determining the true nature of organic impurities in water, and an organic analysis of the residue the true ground of comparison between waters, whether impure from natural or artificial sources. The determination of the dissolved oxygen may also be of much sanitary importance.

The paper concluded with

NEW METHODS OF DETERMINING AMMONIA, CHLORINE, NITRIC AND NITROUS ACIDS IN DRINKING WATER.

Having shown that Bunsen's method of determining ammonia by the use of iron and platinum leads to erroneous results from the presence of nitrogen in iron which is not perfectly pure, Professor Leeds described the following ingenious method of detecting minute quantities of ammonia. The distillates from different samples of waters are placed in test tubes and diluted to the same volume. A small quantity of a standard solution of iodide of mercury in water containing iodide of potassium is then added, and the faint yellowish coloration so produced is compared with that obtained in a series of solutions containing known quantities of ammonia. Instead of using the latter, a much more rapid comparison is effected by means of a wedge-shaped prism filled with a liquid of the same tint. The test tubes are placed in a rack provided with mirrors, so that the light transmitted through the solutions may be compared with that transmitted through the prism. The latter is then moved to and fro until depth of the tints produced is the same. The amount of ammonia corresponding to the thickness of the prism is then read off on a carefully prepared scale. By means of this apparatus the writer just determined the presence of ·000035 of a gramme of ammonia.

SILVERING GLASS.

In reply to various correspondents who are desirous of ascertaining the best methods of coating glass with silver, we would say that we give in our SUPPLEMENT of this week (No. 105) a collection of the best methods, all of which we think will be found practical and useful. The method described by Chapman will be found especially convenient. By its use almost any experimenter, old or young, may make excellent mirrors, either of plane, concave, or convex glass, and produce a great variety of silver ornamentation for home objects, that will well repay the trouble, and in some cases result in substantial profit.

Professor Huxley on Technical Education.

Professor Huxley has recently delivered a lecture on technical Education before an English working men's association, in the course of which he gives his views as to what working men should know. He defines technical education as the teaching of handicrafts, and the requirements thereof he sums up to be reading, writing, and ciphering, a taste for one's calling, an acquaintance with the elements of physical science, a knowledge of a foreign language, and the scrupulous avoidance of the practice known as "cramming."

As to the means for carrying out this ideal education, Professor Huxley strongly advocates the more extended teaching of natural science in the public schools, and he thinks that the mode of instruction should be especially practical and experimental. He also recommends some special means for utilizing in the public interest unusual talent or genius found in schools.

It was Edward Everett, we believe, who regarded anyone who could read, write, and cipher as well educated, and if to that a knowledge of a foreign language was added, the education, he considered fine. Professor Huxley goes a step beyond this, it would seem; and besides his recommendations while excellent, appear rather too general to be susceptible of ready practical application.

The New Museum of Natural History in New York City.

The new American Museum of Natural History, the corner stone of which was laid by Ex-President Grant in 1874, was formally opened recently by President Hayes. The ceremonies consisted in addresses by the President of the Board of Trustees, the President of the Association for the Advancement of Science, and others.

It is not generally known that the fine structure now open, and which is located at 77th street and Eighth avenue in this city is but a small portion—one eighteenth—of the colossal edifice ultimately to be erected. Four entire city blocks have been purchased and set apart for the building, which will be 850 feet wide and 650 feet long, surmounted by a dome 120 feet in diameter. The structure now finished contains the various collections of objects of natural history hitherto kept in the Arsenal in Central Park, besides a large number of new and rare specimens lately added. It is of brick trimmed with granite, and is 70 feet wide and 200 feet long. There are four exhibition stories, and the entire structure is built of iron, concrete and other fireproof material.

A Remarkable Little Steamer.

The small steam yacht Estelle was lately tried at Bristol, R. I., under the direction of Mr. C. E. Emery, C.E. The test lasted eight hours through the waters of the bay as far at times as Beaver Tail, where they met quite a heavy sea.

The thermometer stood at 35° Fah. when the torch was applied to the furnace fires. In four minutes afterward the engines worked water out of her cylinders, with a steam pressure of 25 lbs. to the square inch. One minute later the large cylinder moved. At the expiration of ten minutes from the time the fires were lighted, the Estelle had been backed out of the wharf, turned, and was on her course. During the trip of eight hours she made 103 statute miles, including five sharp turns. Her average pressure of steam was 65 lbs. only, at a temperature of 345°. Her average revolutions of propeller per minute were 130. The expenditure of fuel was considerably under two tons.

On the return trip, after the course to be run was finished, the blower was put on the fire, running steam up to over a hundred pounds, and the little craft showed her heels on a spurt at the rate of sixteen miles an hour.

AMERICAN LOCOMOTIVES FOR RUSSIA.—We understand that the Baldwin Locomotive Works, Philadelphia, Pa., are now proceeding with the construction of fifty large-sized, first-class locomotives, lately ordered for Russia. They are to be completed during March next. In all, nearly 2,000 men will be required on the job, for which about $500,000 are to be paid.

NEW STEAM FOG WHISTLE.—A new fog whistle was lately tried at Bristol, R. I., and in just four minutes after the fire was lighted, it gave a blast which was heard ten miles distant.

SUCCESS OF THE PHONOGRAPH.—Mr. Thomas A. Edison, the inventor of the talking phonograph which we recently described, informs us that he has constructed a new and larger machine which not merely speaks with all the clearness which we predicted would be obtained, but loud enough to be audible at a distance of 175 feet.

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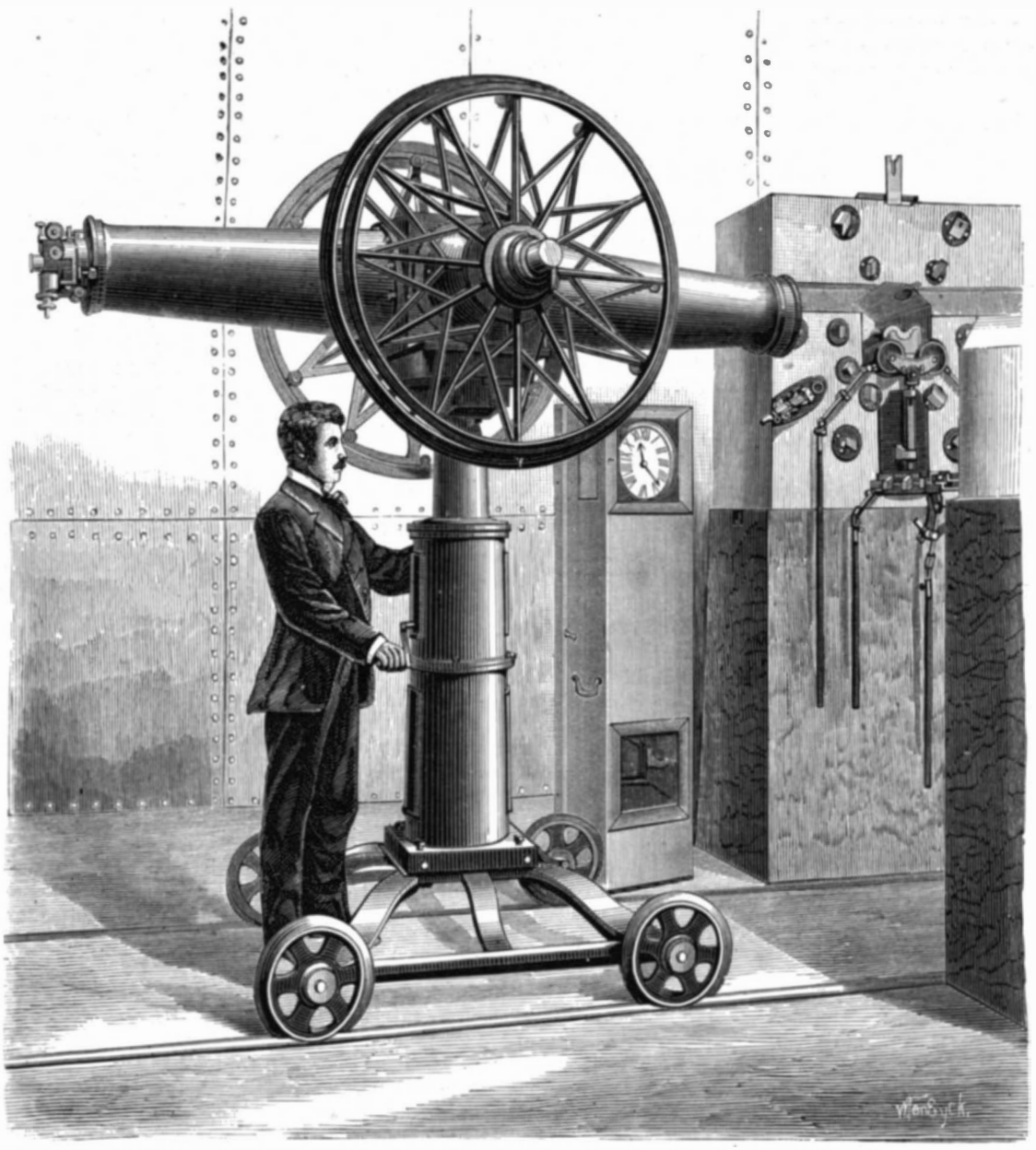
[*Continued from first page.*]

said axis must intersect the earth's pole. A level which rests upon a support or yoke upon the trunnions of the telescope serves to measure and correct the inclination of the axis of rotation. The spider threads above referred to are rendered visible at night by a beam of light coming from a gas lantern placed in the western pediment, which beam is reflected toward the eye-piece by a small prism fixed at the middle of the telescope. A movable screen allows of nice adjustment of the intensity of the light with regard to the brilliancy of the star under observation. For very faint stars an ingenious mechanical contrivance suppresses all light in the field and concentrates it upon the threads, which appear as bright lines against the dark sky.



THE MERIDIAN CIRCLE IN THE PARIS OBSERVATORY.—Fig. 2.

Simple Apparatus.

Many teachers in common school and academies think they cannot illustrate the principles of natural philosophy without expensive apparatus. Beautiful well-made and costly apparatus is, indeed, desirable, but by no means essential to success in illustration. The principles of the lever can be as well shown from the teacher's table, with a common stick and blocks, as with brass levers, fulcrums, etc., made by the skilled workman. Better still, each member of the class can provide himself with the apparatus and prove for himself the truths that may be the subject of the lesson.

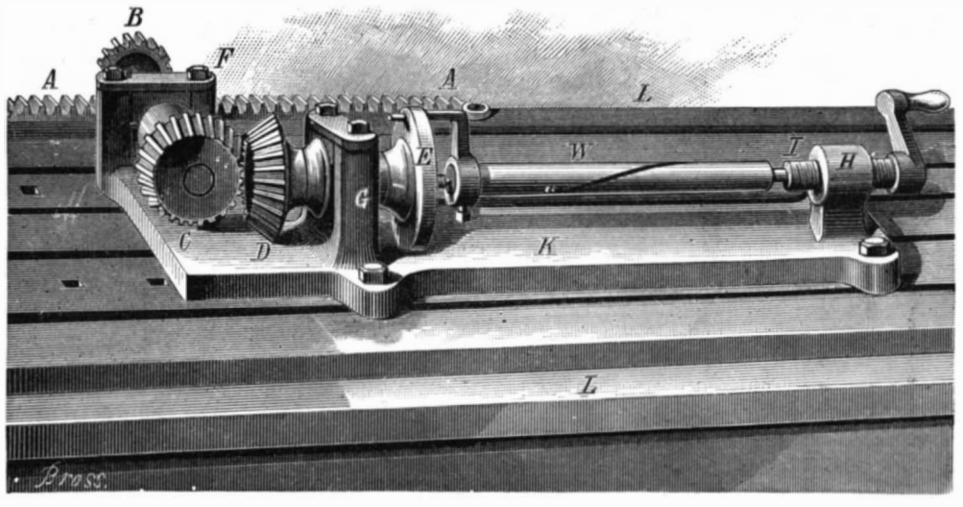
There are three ways in which a pupil may obtain a knowledge of an experiment. First, by committing to memory the words describing such experiment; second, by seeing the teacher illustrate it with proper apparatus; third, by performing the experiment himself. The last is undoubtedly the best way, particularly if it has been preceded by a thorough study of the principle involved, of the manner of the experiment, and of the result to be obtained.

Some years ago I heard an excellent teacher lecture on a subject pertaining to astronomy, in which he made use of several experiments. First, to illustrate that a body will always revolve on its center of gravity; second, to show why the earth is flattened at the poles. These experiments could be performed by means of apparatus found in almost every schoolboy's pocket, namely, a piece of string, a lead pencil or a short stick, and a piece of brass or steel chain not larger than a small watch chain. Tie to the middle of a lead pencil a piece of string about three feet long. Suspend it so that the pencil will balance itself. Now twist the end of the string between the thumb and the first finger of the right hand, steadying and holding the string with the left hand. A circular motion will thus be communicated to the pencil, and it will revolve around the point on which it is suspended. Tie a piece of white string around the middle of the pencil, or its center of gravity, simply to show the position of that point. Now, again tie the first piece of string half way between the end of the pencil and the center of gravity, and communicate the circular motion described above, and we shall observe that the pencil will still revolve around its center of gravity, the point marked by the white string being at rest. It can thus be shown that anything, of whatever shape, will revolve on its shortest diameter. If the end links of the chain referred to above be hooked together, and the string tied to a link and the circular motion given, it will be observed that the chain begins to take an elliptical form, which gradually approaches that of a circle, until at last it becomes a circle and then it revolves horizontally. This shows that even a ring is subject to the same law, that is, revolves on its shorter axis, the center of gravity. Simple as this experiment is, it illustrates the revolution of the earth on its shorter diameter. The above simple articles will illustrate many of the principles in Steele's Philosophy, particularly those illustrated by Fig. 32.

Again, many experiments in hydrostatics and pneumatics are passed over because of a supposed lack of apparatus. Take a bottle of cylindrical form, smooth, about six or eight inches high and three inches in diameter, and fill it with water to the top. Now take a small vial, such as are used by homœopathists for their medical pellets, and fill it with water. Invert it and some of the water will run out, or may be shapen out. Put this, inverted, into the larger bottle, and if it just floats the apparatus is ready for use. If the small vial sinks or is too light, water must be placed in it, or taken out as may be required, until its weight is but a trifle less than the amount of water displaced. By a pressure upon the cork in the larger bottle the small vial may be made to sink, or remain in any desired position in the water.

With this apparatus, which any schoolboy can prepare, all the experiments indicated by Fig. 94, Steele's Philosophy, can be performed. By a pressure upon the cork, water is forced into the smaller bottle. We prove by this, first, that pressure upon water is transmitted in all directions; second, that air is compressible. Upon relaxing the pressure, the small vial will rise to the top, thus proving the expansibility of air. Graduating the pressure upon the cork until the small vial is maintained at the middle of the water, we can illustrate the buoyant force of liquids, shown by Fig. 80 in Steele's Philosophy.

Most principles can thus be illustrated, by a little ingenuity on the part of the teacher, with means within his reach. —*Thos. B. Lovell, in Barnes' Educational Monthly.*



CUTTING SPIRALS AND RIFLE GROOVES.

New Mechanical Inventions.

A new Shoulder Plate for Spoke-Finishing Machines has been patented by Mr. W. McNeal, of Stockton, N. J. Its object is to finish the spokes broader upon the outer than upon the inner edge.

A new Lift Pump in which the necessity of packing the plunger is obviated is the invention of Messrs. G. C. Merrill and C. C. Utter, of Saginaw City, Mich. It consists of a valved pump chamber in connection with a valved plunger having annular grooves for water packing, perforations at the upper end, and an air chamber at the top.

A Tire Tightener, which can be attached to large or small wheels with equal facility, has been patented by Mr. A. G. Shepard, of Malvern, Iowa. The rim of the wheel is permanently expanded, and the tire thus tightened by very simple mechanism.

A new Metal Screw-Threading Machine, the invention of Mr. Samuel L. Worsley, of Taunton, Mass., contains among others the following new features: A mandrel carrying a die for forming the screw threads, a clutch for reversing the motion of the mandrel, a differential motion for controlling the clutch, a leading device, and a blank feeder.

Mr. Russell T. Stokes, of Garnett, Kan., has devised a new Windlass Water Elevator, which consists in combining with an endless chain of buckets a center discharge wheel, which is constructed with inclined partitions forming cells, that lead into spouts extending beyond the open side of the wheel, and which are arranged to direct the streams of water into a discharging trough.

A Dish Washer, patented by G. V. White, of Middletown, N. Y., consists of an adjustable casing with interior propeller wheel that takes up the water through a gauged opening of the casing and throws it into a fixed tube at right angles to the casing, from which it passes, through a revolving tube fitted thereto and a perforated brush head, on to the dishes. The casing is adjusted in the washer by means of a fixed perforated band and suitable locking devices. The dishes are thus cleaned rapidly and thoroughly.

AN INGENIOUS METHOD OF CUTTING SPIRAL OR RIFLE GROOVES WITH AN ORDINARY PLANER.

It is often required to cut spiral grooves in cylindrical work, and our illustration shows how this may be done by the aid of a simple attachment fastened to an ordinary iron-planing machine. Upon the bed of the machine alongside of the table is bolted the rack, A A, into which gears the pinion, B, which is fixed to the same shaft as the bevel gear, C, which meshes with the bevel wheel, D. Upon the same shaft as D is the face plate, E, and in the spindle upon which D and E are fixed is a center, so that the plate, E, answers to the face plate of a lathe. F is a bearing for the shaft carrying D and C, and G is a bearing carrying the spindle to which E and D are fixed. H is a standard carrying the screw and center, shown at I, and hence answers to the tailstock of a lathe. A represents a frame or plate carrying the bearings, F and G, and the standard, H. L represents the table of the planing machine, to which K is bolted. The reciprocating motion of the table, L, causes the pinion, D, to revolve upon the rack, A A. The pinion revolves C, which imparts its motion to D, and the work, W, being placed between the centers as shown, is revolved in unison with E, revolving in one direction when the table, K, is going one way, and in the other when the motion of the table is reversed; hence, a tool in the tool post will cut a spiral groove in the work.

To enable the device to cut grooves of different spirals or twist, all that is necessary is to provide different sizes of wheels to take the places of C and D, so that the revolutions of E, and hence of W, may be increased or diminished with relation to the revolutions of B, or, which is the same thing, to a given amount of table movement.

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NEW DIAMOND TOOL MILLSTONE DRESSING MACHINE.

In the annexed engravings are represented side and end views of a new machine for dressing millstones devised by M. George Roger. We extract the illustrations from the *Bulletin* of the French Society for Encouraging the National Industry, under the auspices of which association the machine has been tested.

A is a face plate, to which the stone, B, is secured by the four clamps, *a*. C is the bed, resting upon a masonry foundation. D is the rotary tool, carrying eight diamonds and revolving 3,500 turns per minute. It is mounted on a carriage, E, which travels across the face of the stone on slides, G, on the support, F. The movement of translation of the carriage is effected by the screw, H, the rate of motion of which is proportioned to that of the stone's revolution. The diamond tool is actuated from the pulley, I, by the belt, I'. K and K', respectively, are fixed and loose pulleys imparting motion to the drum by means of a belt passing over the pulley, L, of the main shaft, M. A lever, P, acting on pinions, P', and P'', which engage in racks, Q and Q', enables the whole tool-carrying apparatus to be moved toward or from the stone, as desired. N is a shaft placed against a wall, which serves to set the lathe mechanism in motion, as described hereafter. On this shaft is a pulley, T, which transmits motion by friction to the disk, U, mounted on a shaft, which is belted to the lathe arbor below. A lever, U', having a counterweight, U'', always gives the necessary pressure to cause the contact of disk, U, and pulley, T. This mode of transmission by friction pulley and disk imparts to the lathe arbor a variable velocity according as the tool operates upon the stone at a portion nearer to or further from the center; so that in this way, whatever part of the stone is presented to the tool, the velocity is nearly constant.

The position of the wheel, T, with relation to the disk, V, is regulated by means of the lever, S, operated by cords, *s*, which are attached to the ends of the tool carriage. A ventilator, V, operated by the special gearing, V', removes the dust produced through the tubes, *v*. The air from the blower is led into a water reservoir, X, and thence, after depositing its dust, escapes by the pipe, *v''*. The traveling tackle, Z, serves to adjust the stone in the machine.

The diamond tool is separately represented in Figs. 3 and 4. A is the tool, P the driving pulley. Eight diamonds are mounted on the surface of the cylinder in sleeves, and in such a way that they may be caused to project more or less by means of a regulating screw. B B' are lubricating cups, and U is the conduit whence dust is drawn by the ventilator from the chamber, E, as shown by the arrows. Access is had to the tool by lifting the cover, C.

Fig 3.

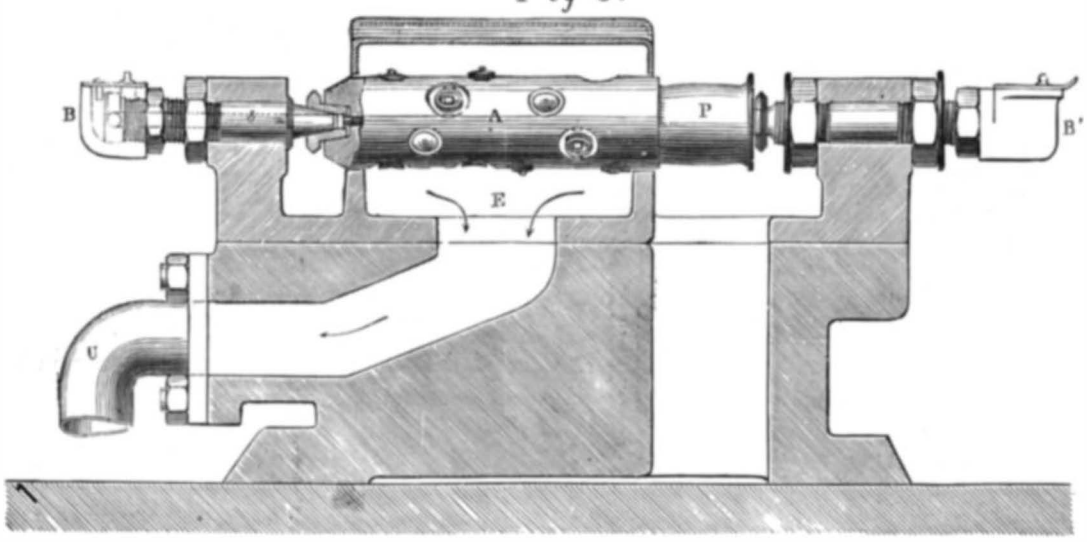
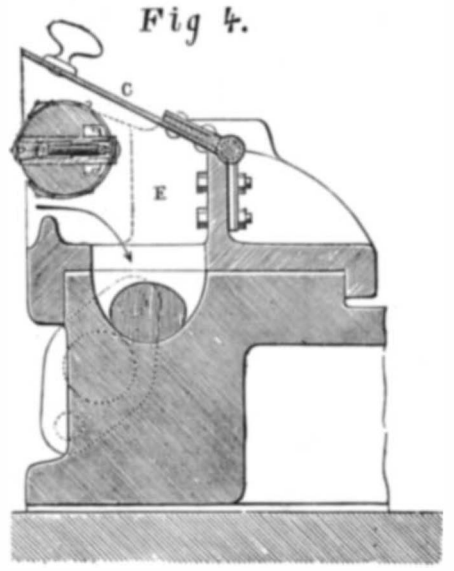


Fig 4.



NEW DIAMOND TOOL MILLSTONE DRESSING MACHINE.

New Inventions.

Mr. Asa T. Martin improves upon an Umbrella Holder previously patented by him November 6, 1877. The device embodies a swiveled clamp for holding the umbrella handle adjustably, and means whereby an ordinary umbrella may be attached to a vehicle.

A Grain Car, embodying a new and strong construction, has been patented by Mr. James Anderson, Jr., of Anderson, Ohio. There is a novel arrangement of supporting trusses, besides devices which greatly facilitate the operations of loading and discharging.

A new Washing Machine, patented by Mr. Jacob H. Jeffrey, of Orland, Ind. A receptacle is attached to the lower end of a rod, which last is moved up and down by a lever. The clothes are thus forced into the receptacle wherein air and water are forced through them, causing them to be rapidly and thoroughly washed.

Mr. Samuel B. Seymour, of Mount Morris, N. Y., has devised a ladder which is made in two or more sections, so put together that either a long or a short ladder can be produced at will.

Mr. George Cornwall, of Garden City, N. Y., has patented an improved wheel tire. Around the usual iron tire is passed a rubber tire, and around this again is an iron tire made in sections, so that each section may yield or move inward as the weight comes upon it, so as to prevent noise, jarring, and wear. They are secured in place by bolts which work in rubber blocks.

An ingenious Spark Arrester for locomotive smoke stack or ordinary draft flues has been patented by M. Charles Mattoni, Jr., of Belmont, N. Y. It is so constructed that when the locomotive is in motion a vacuum is formed beneath the plate increasing the draft, and the smoke and cinders are carried back in the cylinder and thence through pipes to the end of the train.

A simple Adjustable Supporter for sustaining Chins of Deceased Persons has been patented by Mr. Thomas Boylston, of New York city. Its base rests upon the breast bone, and it may be shortened or lengthened at will.

A Shoe Fastener, patented by Mr. Charles L. Morehouse, of Cleveland, Ohio, consists of a base, from the ends of which a hinge stud and catch stud project through the leather. A link is attached to the hinge stud, and being turned down upon the catch stud, is held in place by the head.

In a Roof invented by S. H. Reed, of Greensburg, Penn., a gutter is formed by making a fold in a sheet of metal, corrugated longitudinally, and which projects at right angles. The gutter is connected with the lower edges of the sheets forming the roof by means of a seam. It is easily constructed.

Fig 1.

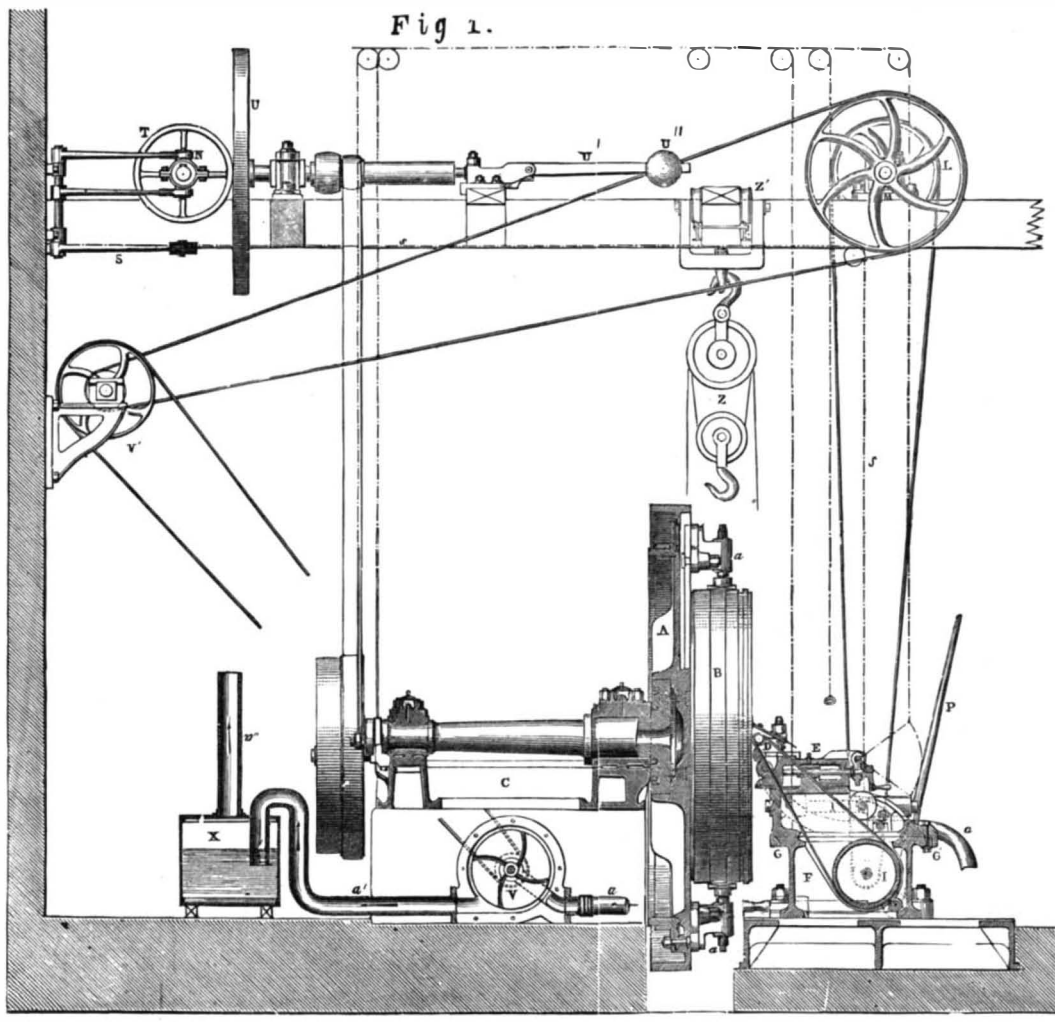
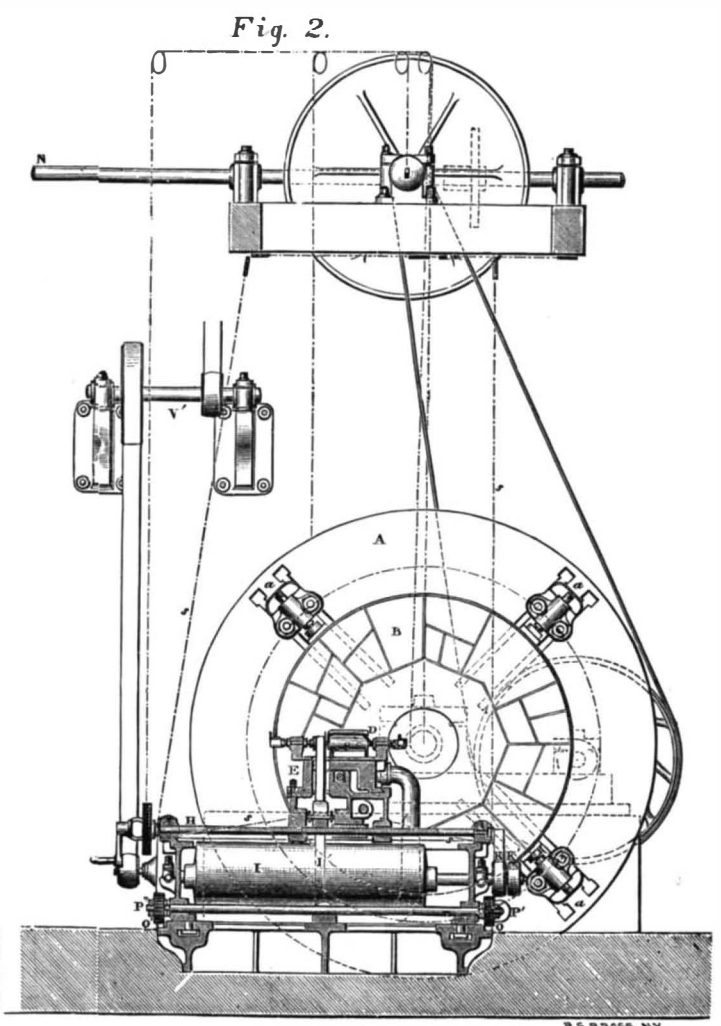


Fig. 2.



R.S.BROSS, N.Y.

NEW DIAMOND TOOL MILLSTONE DRESSING MACHINE.

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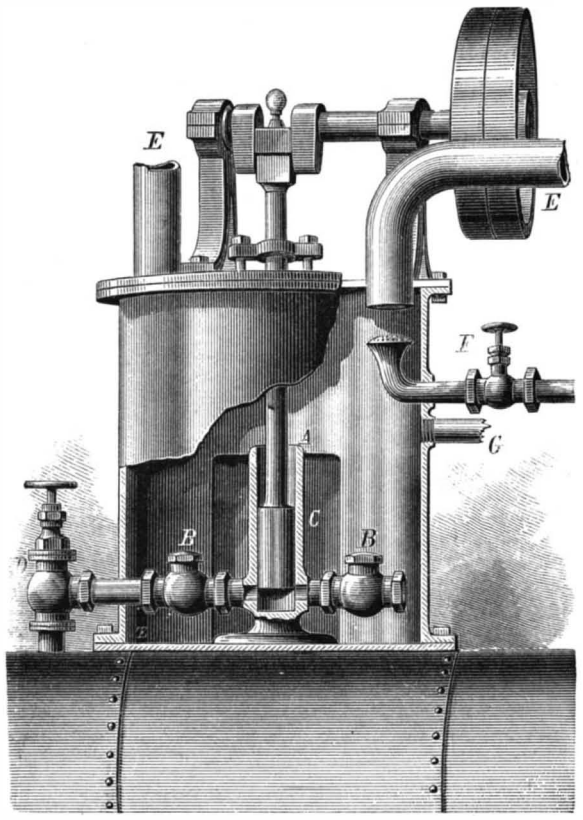
RICE'S IMPROVED BOILER FEEDER.

The annexed illustration represents a new boiler feeder in which the pump is placed inside the heater. It is claimed that the feed water is thus warmed to 212 degrees; that there is no loss by radiation, and if the device is placed on top of the boiler or above the water level therein there is no danger of pump or heater freezing up in winter for want of care, as both are self-drained into the boiler. The construction of the apparatus will be readily understood from the engraving.



A is the pump, driven with crank, shaft, and pulley as shown. At B are the check valves, so placed as to be easily removable through the door, C, for repairs. This door is made sufficiently large to admit of the taking out of the entire pump if desired. D is the feed pipe and cock from heater to boiler, and at E E are the exhaust pipes from engine to heater and from the latter to open air. F is the cold water pipe with sprinkler from tank or hydrant, provided as shown with a regulating cock. G is the overflow or waste pipe.

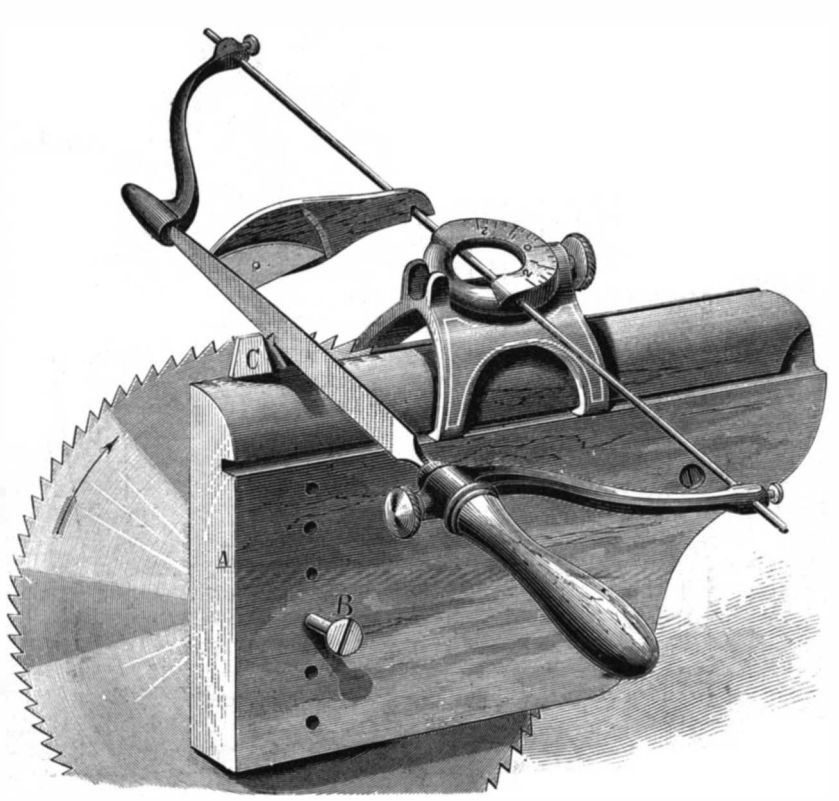
The manufacturer further claims that by this device a freer and drier exhaust is obtained, that it is a good lime extractor, and that it is highly productive of economy in the use of steam. For further information address Mr. D. E. Rice, 191 Atwater street, Detroit, Mich.

ROTH'S IMPROVED SAW FILE GUIDE.

The annexed illustration represents Roth's saw file guide which is adapted for filing every description of circular saws, of any diameter, whether having large or small teeth. The ordinary hand file, three cornered, flat oval, or round, is employed, and so operated so that the cutting edges of the teeth will all be of the same bevel and pitch.

A saw once filed may be readily refiled, when necessary, in, it is claimed, the best manner and with the least expenditure of time and power. A table is arranged in connection with the guide, giving such pitches and bevels as have been found by experience to be the best for the different kinds of saw, so that it is only necessary to set the guide to the bevel and pitch as given in the table for each particular type of blade, and the inexperienced workman is enabled to file a saw with ease and accuracy.

The annexed illustration shows the guide arranged for filing circular saws. The saw is adjusted in the clamp, A, and is securely held by the screw, B, which passes through a round washer of the size of the hole in the center of the blade. The saw may thus be easily turned on its center as the teeth are filed at the top of the clamp, and each tooth is given the same pitch and bevel. The gauge, C, serves to keep the saw true. The series of holes shown in the clamp are for the reception of the central screw when securing saws of different sizes. The application of this device to filing hand and all straight saws is illustrated in the SCIENTIFIC AMERICAN of January 1, 1876. Two sizes of the invention are made; one for small toothed saws, requiring three-cornered files, and the other for large toothed saws of every kind, necessitating the use of large flat files. The device, we are informed, has been successfully tested by many mechanics. For further information, terms, etc., address the manufacturers, E. Roth & Brother, New Oxford, Adams county, Pennsylvania.



IMPROVED SAW FILE GUIDE

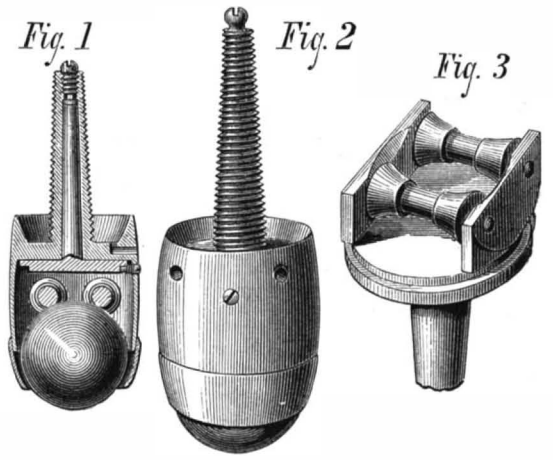
A New American Science Expedition.

Professor Alexander Agassiz is starting for Havana with an assistant, there to go on board the Coast Survey steamer Blake, which has just sailed on a surveying cruise, that will occupy this winter, in the work of obtaining soundings in the Gulf of Mexico. As this work is conducted, it is made no less useful to terrestrial physics and natural history than to navigation. By a study of the animals dredged from the bottom of the Gulf, Professor Agassiz will be enabled to make important comparisons with the fauna of the Atlantic and especially as to growth, habits, migrations, and changes of living forms found in the waters near the British Islands and the Scandinavian Peninsula. The expedition is under the command of Lieutenant Commander Charles D. Sigsbee.

KONZ'S IMPROVED FURNITURE CASTER.

The annexed engravings represent a new friction roller furniture caster, claimed to be strong, durable, and easy in motion.

The upper case or cylinder is cup-shaped above to receive the leg of the piece of furniture. It has a pivot screw which incloses a revolving interior shaft, Fig. 1, which, at its upper end, has a concave hardened bearing to turn against the point of the screw pivot and to receive a little oil. The short interior cylinder which, with its jaws, constitutes the frame for the friction rollers, is shown in Fig. 3. These rollers alone come in contact with the lower supporting ball. A spring ring is placed on the lower portion of the cylinder to hold the ball in place, and a set screw enters a groove in the short interior cylinder, and, while confining the two portions of the caster together allows the lower part to revolve within the upper. Another object of this arrangement is that the friction rollers may automatically adjust themselves, so that their axles shall be parallel with the axis of motion of the ball roller. The small apertures visible on the exterior of the device, in Fig. 2, are designed for the insertion of a suitable wrench to drive the shaft into a piece of furniture and also to enable it to be ascertained, when the bottom of the leg is flat upon the bases.



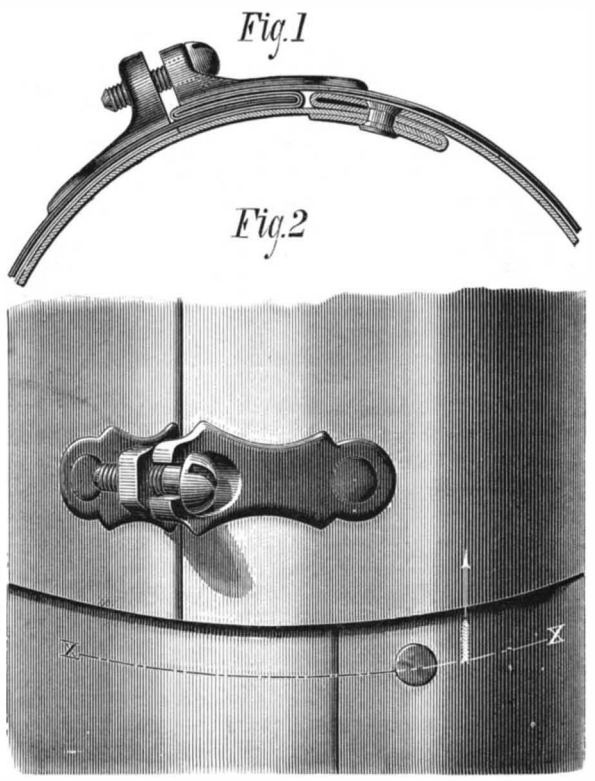
Patented October 9, 1877. For further information address the patentees, Messrs. S. Konz and P. W. Carle, 244 Greene street, Louisville, Ky.

The Great Virginia Meteor.

Professor J. L. Campbell, of Washington and Lee University, has been collating and discussing the data for the great meteor which was seen in many parts of Virginia on the afternoon of November 20. He concludes that its height was about 100 miles; but this estimate is merely approximate. Its course seems to have been 8° or 10° west of north. Its explosion appears to have taken place over the southeast corner of Halifax county, about 15 or 20 miles a little south of west from Clarksville, 100 miles from Richmond, 80 from Lexington, and 55 from Raleigh. It was a meteor of unusual size and brilliancy, and detonated loudly when it exploded.

DRAPER'S STOVEPIPE JOINT.

The difficulties experienced in putting up stovepipes are familiar to every housekeeper, and any device that will obviate the annoyance would be a grateful boon to many. We illustrate herewith a simple contrivance which would seem



to be a good improvement, and by its means stovepipe lengths can be put together more readily and more securely, it is claimed by the inventor, than by the old method. It consists in securing the seam of each length at one end by a rivet, as usual, while the edges at the other end are connected by an adjustable joint formed by two lugs, riveted one on each side of the seam and secured together by a set screw. In putting together lengths of pipe, the riveted end of a pipe is slipped into the end of the next pipe, which is secured by the lugs. When the joints are made they can be tightened by screwing up the screw. In this manner a long stretch of piping can be made almost rigid, and each joint is perfectly tight, not only between each length of pipe, but along the seam also, one edge of the rim of the seam being bent to an S, forming a recess, into which the other end fits, as shown in Fig. 2, thereby preventing any escape of gas. One end of the pipe is held rigidly at the same diameter, while the end, secured by the screw clamp, can be contracted or expanded as required.

Patented October 24, 1876. For further information address the inventor, John Draper, Petrolia, Ontario, Canada.

Rapid Locomotive Building.

On November 15, in the Michigan Central Railroad shops at Jackson, Mich., two gangs of workmen numbering fourteen men each attempted to put two locomotives together in the shortest time yet made. The Detroit *Free Press* says:

"The jacks were applied, the huge boilers were raised and bolted on their frames, then they were placed on their wheels with all possible expedition, while simultaneously work was progressing on every portion of the machines, which were rapidly assuming perfect form. Water was let into the boilers, and even while men were working at the grates the fires were kindled and the "infants" began to warm up for their work. At last one of them is ready for the smoke stack, and is pulled along the track until she stops beneath the one designed for her, which hangs above her.

"Lower away, cast off your tackle, go ahead," and the yard engine pulls her out of the house and to another shop for completion, her constructors working as she moves, and busy hands being employed in fastening the bolts which hold the smoke stack in its place. A few moments more and the last screw is turned, the last bolt is fastened, the engineer stands in his place, and in just two hours and fifty-five minutes from the time the signal to commence was given, the throttle is pulled, and the first of the twins moves off completed, followed a moment later by her mate."

All the pieces of machinery connected with the locomotive had been finished and ready for use beforehand, but none had been fitted. On the same day, the two new engines made trips of 76 miles each and worked nicely.

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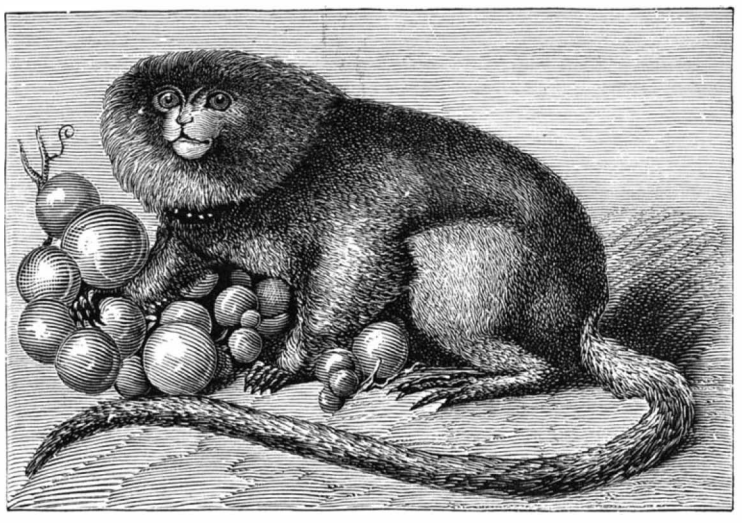
THE SILKY MARMOSET.

The marmoset is a South American monkey, about the size of a squirrel. The silky marmoset, which we illustrate, is of a golden yellow color, the fur being very soft and silky and forming a kind of mane upon the neck. The feet are five-toed and have sharp claws; the tail is long and bushy, but not prehensile, and the body is covered with soft wooly fur. It is easily tamed and makes an interesting and affectionate pet. It is not so intelligent as the other monkeys, and its constitution is so delicate that it easily dies from the exposure of even temperate climates. It is peculiarly sensitive to cold, and likes to have its house well furnished with soft and warm bedding, which it piles up in a corner and under which it delights to hide itself. They are very fond of flies, and will often take a fly from the hand of the visitor. It has a strange liking for hair. One of these little creatures, which was the property of a gentleman adorned with a large bushy beard, was wont to creep to its master's face, and to nestle among the thick masses of beard. Its food is both animal and vegetable in character; the animal portion being chiefly composed of various insects, eggs, and it may be an occasional young bird; and the vegetable diet ranging through most of the edible fruits. Cockroaches are a favorite article of food, and gold fish are peculiarly relished.



THE SILKY MARMOSET.

Effect of Smoking on Artificial Teeth.

Mr. Wm. M. Richards, of Wisconsin, writes to us to say that vulcanized red rubber dental plates are turned black by tobacco smoke. The plates, he states, regularly color by degrees, after the fashion of meerschaum-pipes. This will account for numerous cases of deteriorated plates, the owners of which have asked us to explain, and at the same time exhibits a new evil of the deleterious habit of tobacco smoking.

A BEAUTIFUL ORCHID.

We lately illustrated some beautiful varieties of orchids, and the illustration which we present this week represents one of the most elegant of the species known. Its flower hangs in graceful bunches from the bases of the spreading leaves. The color is a deep yellow ground spotted with rich crimson points of velvet. Each flower on the bunch is spotted like a leopard's skin. It is an extremely delicate plant and hard to raise. It is known to botanists as the *renanthera Lowii*.

"Muslin" Glass in Colors.

The various methods now in use for rendering glass opaque are, first, painting or covering one of the faces with any opaque white substance, such as alabaster, barytes, etc., mixed with oil. Second, causing the surface to be attacked by hydrofluoric acid. Third, covering the surface with ground glass in powder and submitting the whole to vitrification at temperatures low enough to cause adherence of the powder without producing deformation of the sheet. Fourth, grinding the surface with emery. Fifth, abrading it by the sand blast; and sixth, depositing thereon a salt in crystalline form.

A new process has recently been devised by M. Aubriot, by means of which he produces so-called muslin glass of a great variety of colors. He proceeds as follows: After carefully cleaning the surface a layer of vitrifiable color is laid over it. The vehicle is simply gum water, and care is exercised that the pigment is evenly applied. The glass is then submitted to a mild heat until the water has evaporated, when a stencil of the desired pattern is laid over the surface, and a stiff brush is used to remove the loose pigment from the parts which are to be transparent. The glass is next inclosed in a frame and above it is extended a piece of tulle, or, if desired, embroidered lace, the embroidery in the latter case being so disposed as to harmonize with the ground pattern previously made. The whole is then hermetically closed in a box which contains in its lower portion a reservoir in which is a certain quantity of dry color in the form of impalpable powder. This, by an air blast, is blown evenly upon the glass, and adheres to the latter wherever the surface is not protected by the threads of the lace. In this way the pattern of the latter is defined. In order to fix the powder, the sheets of of glass are placed in a steam chamber, where the steam moistens the gum and causes the powder to adhere. The color is then burned in a special furnace. By using different colors, it is said that very beautiful designs can be produced in this way, opaque or transparent according as the pigments themselves are the one or the other. Remarkable effects are obtained by the superposition of the tints.

A BEAUTIFUL ORCHID.

The Action of Anæsthetics.

Some new conclusions relative to the manner of action of anæsthetics are reached by Binz in the *Archives for Experimental Pathology*, and Ranke in the *Centralblatt*. The former considers that these agents possess the power of producing a kind of coagulation of the substance of the cerebral cortex, whilst other agents, though nearly allied to the former in chemical composition, do not possess this power. Ranke takes a similar view, and states that he has found that the action of chloroform, ether, and amyl on frogs first produces a condition in which no contraction can be induced in muscle by any kind of irritation applied to the motor nerves, though the muscular tissue itself reacts to direct stimulation, and the current in the nerves remains constant, both in force and direction. Professor Ranke observes that anæsthetization obviously cannot depend in such a complete coagulation as admits of no further change, since the effects by anæsthetic agents are but transitory. But he thinks that it is very conceivable that an action which, in its final stages, leads to coagulation of albumen, may, in its earlier stages, render, to a certain extent, fixed and immovable the albuminous molecules in the ganglion cells of the brain, and afterwards in nerve and muscle, the effect passing off with the removal of the cause.

Volatilization of Liquids in Gases.

M. Kirchmann has recently observed that the volatilization of certain volatile bodies is retarded or hindered in an atmosphere of carbonic acid, while in the case of others it is augmented. Camphor scarcely volatilizes at all in carbonic acid, and the same is true of chloroform and bisulphide of carbon. Ether, methylic, ethylic, and amylic alcohols, and water are more volatile in carbonic acid than in air. If a current of the gas be directed over ether, the outer surface of the vessel becomes covered with ice. This is not the case when an air current is used. Etherized alcohol is rapidly deprived of ether by a gas current; and alcohol or water is easily thus removed from a mixture of turpentine or water. In general it is concluded that dry carbonic acid gas furnishes an excellent means for removing from essential oils the water which accompanies them in their extraction.

New Agricultural Inventions.

A new Cultivator, devised by Mr. Frederick L. Hilsabeck, of Shelbyville, Ill., is so constructed that the plows may have a free lateral and vertical movement, may be readily adjusted wider apart or closer together, and may be securely supported away from the ground in turning around and in passing from place to place.

Mr. John Johnson, of Pana, Christian county, Ill, has patented a Check Rower, which is an improvement in the class of check rowers in which the action of the seed slides and the times of dropping the seed are regulated by a cord or chain passing over a wheel on the machine and fastened to movable stakes at each end of the field.

Mr. Joshua C. Terrill, of Owensborough, Ky., has patented a combined Plant Setter and Seed Planter which improves on the construction of the plant setter patented by Messrs. C. J. and H. W. Williams, January 30, 1877, so as to adapt it to be used also as a planter for planting corn and other seed, in an efficient manner.

A new Stump Extractor of very strong and powerful construction wherein hooks and chains and the labor of hooking and unhooking the same are dispensed with, has been devised by Mr. Cornelius Barlow, of Sharpsville, Ind. There is strong lever mechanism, and the device is adapted for raising buildings, etc.

An improved Neck Yoke Adjuster, whereby the attaching of animals is facilitated, has been patented by Mr. John Dalton, of Bonchea, Wis. It consists of a sleeve-shaped part for attaching the breast strap, a ring below the same for connecting with a hook at the end of the neck yoke, and a braced loop back of the ring for the hold back strap.

A steam plowing and scraping attachment to cars has been patented by S. J. Shankland, of Laramie, Wyoming. It consists of the combination, with the scrapers which are used for railroad grading, and which receive a forward and backward motion by a side connection of a movable car with a fixed back car, of a dumping mechanism, consisting of chains attached to the scrapers and passing over cranes of the plow beam and over pulleys of the fixed and movable cars to the end of the movable car, where they are adjustably attached, so as to regulate the distance the scrapers are to be dumped from the track. It will produce a great saving of time and labor.

James M. O'Neall, of Fort Worth, Texas, has patented a Band-Cutting Feeder for Thrashing Machines. The object is to provide an improved machine for cutting the bands of gavels or bundles of grain, and feeding the same to the cylinder of a thrasher. The bundles are received upon an endless traveling apron provided with teeth or claws, and by it conveyed under rotary cutters which sever the bands, the grain being then scattered or spread out by a vibrating rake into a thin sheet as it passes to the toothed cylinder.

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HYMER'S COAL CABINET.

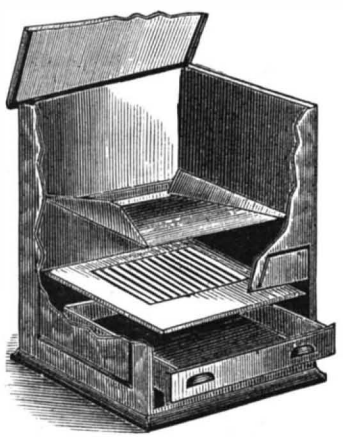
The annexed engravings represent a new box or cabinet designed for holding coal. It will contain from 5 to 20 bushels, and has the advantages of screening the slack from the lump coal, depositing the former in a drawer for covering

Fig. 1.

fires at night. It also retains all dust, and thus prevents the same from soiling carpets.

Fig. 1 shows the device closed, and in Fig. 2 portions are broken away to exhibit the interior construction.

Fig. 2.



The coal is inserted through the door above and falls upon a feed hopper, its weight bearing upon the latter and wedging it the more tightly in place. After passing through the hopper the coal falls upon the grate shown, through the bars of which the dust and slack drop into the drawer below, whence they may be easily removed. In case lump coal is used the grate may be removed and a solid bottom substituted.

The device can be made to fit any corner or opening and to match any furniture or covering. Patented July 24, 1877. For further particulars address the inventor, Mr. Christopher Hymers, 1601 Monroe street, St. Louis, Mo.

Volcanic Signs in Nebraska.

The seat of disturbance is on the banks of the Missouri, in Dixon county, about thirty-six miles from Sioux City. A bluff, about 1,000 feet long and 160 feet high, sloping at an angle of 60° to 80° toward the river, is at present the place where the phenomena are most exhibited, but other bluffs at a few miles' distance have been similarly affected. Two years ago a portion of this bluff, half as large as what is left, broke away and fell partly into the river. On the bluff sounds were heard proceeding from the interior, especially on placing the ear to the ground. Flames sometimes broke forth, occasionally at night. Steam escaped from crevices. On digging into the bluff, intense heat stopped the work after proceeding a few feet. Selenite, alum, and magnesia sulphate in crystals were abundant. Professor Augheyregards these features as not volcanic in the usual sense of the term, but simply the result of local chemical action. The formation is cretaceous. The bluff is capped by calcic carbonate. Beneath are shales containing ferric bisulphide in crystals or pyrites. Below the shale is a soft limestone, containing carbonates of magnesia and alumina. The chemical reactions consequent upon part of the soil being soaked with water after its fall toward the river, have been the decomposition of the pyrites, the production of sulphuric acid, and the attack of the acid on the alkaline carbonates. The heat evolved in the first of these reactions is, of course, very great; in the latter part the violence of the performance must be increased by the liberation of carbonic anhydride. All the authenticated disturbances are thus easily explained. Professor Aughey does not connect them with the earthquake. He thinks the bluff might furnish alum and other salts in quantities sufficient for profitable manufacture.

ASTRONOMICAL NOTES.

OBSERVATORY OF VASSAR COLLEGE.

The computations of the following notes are prepared by students in the Astronomical Department of Vassar College. They are approximate only, but sufficiently accurate to enable ordinary observers to find the planets.

Position of Planets for January 1878.

Mercury.

Mercury may be seen in the evening twilight during the first week in January. It rises on January 1 at 8h. 32m. A.M., and sets a few minutes before 6 P.M., about 3° north of the point of sunset. On January 31, Mercury rises at 5h. 49m. A.M., and sets at 3h. 7m. P.M. In the latter part of the month it should be looked for before sunrise.

Venus.

On January 1, Venus rises at 9h. 59m. A.M., and sets at 8h. 23m. P.M. On the 31st, Venus rises at 8h. 7m. A.M., and sets at 7h. 47m. P.M.

Venus will be very brilliant all through January, and at the greatest brilliancy on the 16th. It passes the meridian on that day a little before 3 P.M. at an altitude of about 41° (in this latitude) and can be seen with the eye. Venus passes near the moon on the 7th.

Mars.

Mars, although smaller than in the autumn, is still a striking object in the evening skies. On January 1, Mars rises at 11h. 41m. A.M., and sets at 19m. after midnight. On the 31st, Mars rises at 10h. 24m. A.M., and sets at 11h. 54m. P.M.

Jupiter.

Jupiter's daily path lies so nearly with the sun's that it will not be seen in the early part of January. In the last week of January it may be seen before sunrise. On the 31st, Jupiter rises at 6h. 13m. A.M., and sets at 3h. 25m. P.M.

Saturn.

Saturn, although so small as seen by the eye, is still the most interesting object to astronomers. The ring which is so beautiful when seen obliquely is now (seen almost in its plane) narrowing steadily, and with a small glass seems little more than a bright line across the ball of the planet.

Titan, the largest of Saturn's moons, can be seen with an ordinary telescope. It goes around Saturn in about sixteen days; and as on December 12 it was far on the left of Saturn (as seen in the telescope), it will have made one revolution and be on the right of Saturn by January 1.

On January 1, Saturn rises at 10h. 51m. A.M., and sets at 9h. 56m. P.M. On January 31, Saturn rises at 8h. 59m. A.M., and sets at 8h. 13m. P.M.

Uranus.

On January 1, Uranus rises at 8h. 33m. P.M., and sets at 10h. 5m. A.M. of the next day. On the 31st, Uranus rises at 6h. 30m. P.M., and sets at 8h. 4m. the next morning.

Uranus follows, by a few minutes of right ascension, the bright star Regulus, and is on nearly the same parallel of declination.

Neptune.

Neptune rises a little before 1 o'clock January 1, in the afternoon, and sets a few minutes after 2 on the morning of January 2. On January 31, Neptune rises at 10h. 47m. A.M., and sets at 10m. after midnight.

Astronomical Notes.

BY BERLIN H. WRIGHT.

PENN YAN, N. Y., Saturday, January 5, 1878.

The following calculations are adapted to the latitude of New York city, and are expressed in true or clock time, being for the date given in the caption when not otherwise stated.

PLANETS.

Mercury sets	5 42	evening
Venus "	8 27	"
Mars in meridian	5 53	"
" sets	0 18	morning
Jupiter "	4 41	evening
Saturn in meridian	4 9	"
" sets	9 43	"
Uranus rises	8 20	"
Neptune in meridian	7 11	"
" sets	1 55	"

FIRST MAGNITUDE STARS.

Sirius rises	6 37	evening
Procyon "	6 12	"
Spica "	0 57	morning
Regulus "	8 16	evening
Vega sets	8 26	"
Altair "	7 13	"
Fomalhaut sets	7 50	"
Capella in meridian	10 5	"
7 stars (cluster) "	8 38	"
Aldebaran in meridian	9 27	"
Betelgeuse "	10 46	"
Algol in meridian var.	7 55	"

REMARKS.

Mercury is nearly invisible, setting 1h. after the sun. Venus is in *Aquarius*, and directly south 10° of the X-shaped figure composed of three stars of the third magnitude and one of the fourth. Mars is in a cluster of fourth and fifth magnitude stars in *Pisces*. He was at his eastern quadrature January 4. Jupiter is invisible, setting with the sun. Saturn is in *Aquarius*, east of Venus about 15°. He is an object of considerable interest at present, owing to the fact that his rings soon disappear. This event transpired last in 1861. The sun is ½° and the earth 2¾° above the plane of the rings. Hence the northern surface is illuminated, and that surface is presented so very obliquely that the rings are quite invisible with small telescopes, and through more powerful ones appear like two handles projecting from opposite limbs of his disk. Uranus rises at 4m. later, and is 4′ or 1° east of Regulus, having the same declination.

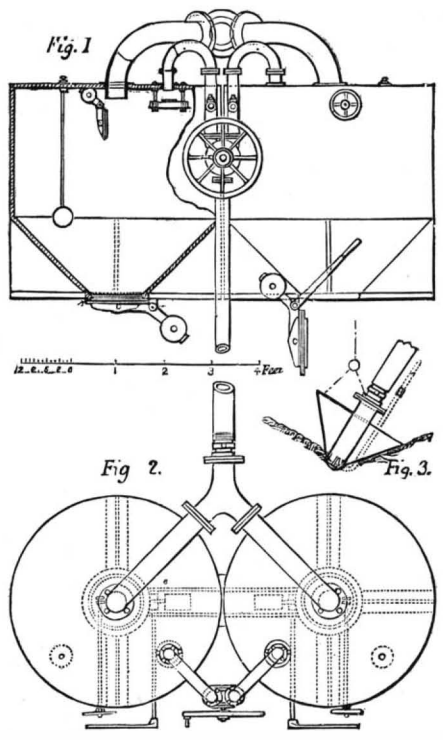
By noting the time of rising, southing or setting of the planets, the reader can determine about where to look for them as soon as they become visible.

A New Utilization for Jute Fiber.

M. Imbs, of Paris, has discovered that by means of jute threads woven in with other textile materials most beautiful and curious effects of light and color may be produced. The fiber takes dyes readily and in a peculiar way, and on a simple fabric may be so arranged as to imitate velvet in relief patterns. It is proposed to utilize this discovery for making wall tapestries.

REEVES' EXCAVATOR.

The employment of pumps in the excavation of sand and loose materials can now no longer be regarded as a novelty Hitherto, however, in all applications of the principle of suction to this purpose the process has been slow in action, subject to frequent stoppages, and accompanied by severe wear and tear of the machinery, consequent upon the lifting and shifting about, and also admission of sand and grit into the valve chambers of the pump. In the system illustrated the danger from this cause is removed by keeping distinct and detached the air pump and the sand tank. It is kept entirely above water, with the exception of a suction pipe through which the soil is drawn. The greatest facility for



working is combined with portability, as the machine, being entirely contained within one barge, can be towed or warped into harbor during bad weather, or moved about readily from place to place. When employed upon wall or quay foundations the same advantages are secured by placing the apparatus upon a truck running upon rails. In sinking caissons or cylinders by this method, it is not necessary in order to pump out the water to place a heavy air-lock and other weights at the top, and to maintain a bell full of compressed air in the bottom, nor is it necessary to leave large hollow spaces and shafts in the masonry or concrete for the conveyance of men and spoil materials, as are required under the pneumatic method. Regularity of subsidence is secured by the use of a flexible sand pipe, which can be directed into any corner of the caisson of however irregular form. Rapidity in sinking may be obtained by building the caisson almost solid, for, as already stated, the usual large air spaces and shafts are no longer required. Fig. 1 represents the end view, Fig. 2 the plan, and Fig. 3 the flexible sand pipe.

Where the water is deep, and the cylinder to be sunk of small diameter, it is not necessary to carry the latter up above the surface of the water at once, but only to put together a length sufficient to prevent sand and silt from being washed into the cylinder by the scour of the currents.

The apparatus has received a very extensive trial on the piers at the Tay Bridge, sixty having been sunk solely by this system. The foundations of these piers comprised in all 142 cylinders, varying in size from 6 feet to 31 feet 6 inches in diameter, and in some cases penetrating to a depth of 35 feet below the river bottom in 50 feet of tidal water.

It has also been adopted for the Severn bridge, and on a very large scale by the North British Railway Company at Dundee in filling up the vast waste behind the Dundee Esplanade with sand sucked up from the bed of the River Tay.

By the employment of small grouped charges of dynamite or lithofracteur, chalk and clay can be rendered sufficiently fluid to rise freely into the pump, the effect of such explosives on those substances being to convert them into a pulpy, slimy state, and not, as in the case of harder rocks, to shatter them into splinters.—*Engineering.*

A New Tanning Process.

M. Charles Paesi, an Italian chemist, has recently discovered a new mode of tanning, which is stated by the *Journal d'Hygiene* to be much superior in its results as well as more expeditious than any mode in which tan bark is used. It consists in macerating the skins in a bath of perchloride of iron and sea salt dissolved in water. The operation lasts for from four to six months. The perchloride is a powerful disinfectant and is said to render the industry much more healthy than it now is.

PRIZES are offered by the city of Munich for a design for a monument to Liebig. The first is $400, the second $300. Models, which should not exceed with pedestal 3 feet in height, will be transported to Munich free by the Commission, and must be submitted between June 1st and 15th next.

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Communications.

Our Washington Correspondence.

To the Editor of the Scientific American:

Business in the Patent Office is steadily increasing, the receipts in cash for the month of October being $59,042,59, the greatest amount received in any month of November since the establishment of the office, an increase of over ten thousand dollars over the receipts for the same month last year, and of four thousand over the previous month of this year. Notwithstanding this the patent agents of this city, almost without exception, are complaining of hard times, and that they are doing next to nothing; from which it would appear that your agency, with the others outside of Washington, must be doing the cream of the business.

The accounts of the Patent Office are arranged in monthly statements, so that they can be readily compared, as the officers have an idea that the monthly receipts are a tolerably correct measure of the fluctuations of business throughout the country; that when all classes of industry thrive the best, the applications for patents and the receipts of fees increase accordingly; and that by comparing the receipts of the office, they can form a good idea as to the state of business throughout the country. From the present steady increase of receipts, they therefore argue that business generally is improving, and that an era of prosperity is now about to begin.

PATENT OFFICE PRACTICE.

A recent decision of the Commissioner, in the case of C. R. Everson's application for a patent on bottoms for washboilers, shows a liberal spirit of construction of the patent laws, and it is to be hoped that some of the examiners will take due notice thereof and govern themselves accordingly, thus earning for themselves good names instead of the bad ones they now get from both applicants and attorneys. In the case referred to, Mr. Everson wished to obtain a patent on making the bottoms of washboilers, having two pits, in one piece, as heretofore it had been the practice to swage each pit in a separate blank and join them together between the pits, the applicant claiming that no one but himself had succeeded in making the double pitted bottoms in one piece, owing to the metal breaking between the pits during the process of swaging. The applicant had overcome this difficulty, and therefore asked for a patent covering the idea of making such bottoms in one piece, but his application had been refused by the examiners, on the ground that there was no invention in making in one piece what had heretofore been made in two. The Commissioner reversed this decision, stating that the applicant had shown something beyond a mere duplication of the dies, mechanical skill, or good judgment. The use of the seam between the pits had long been felt as a great defect in this class of bottoms, but no one had ever succeeded in putting double pitted bottoms in one piece on the market, which showed that there was a great difficulty to overcome in manufacturing them. By considerable experimenting, the applicant had arrived at the right proportions in making the blank which allowed of both the pits being formed in one piece, without breaking the metal between them; and as this experimenting showed that a mere duplication of the punches or mechanical skill was not sufficient to accomplish the desired object, and as it overcame a difficulty long known, but which no one had heretofore remedied, although the amount of invention is not very great, yet if found to exist at all, which the Commissioner thinks was fully proved, the applicant should receive his patent.

In the interference case of Yost and Warner *vs.* Powell, the Commissioner affirmed the decision of the Board of Appeals and Interference Examiner, that Yost and Warner were the inventors of the combination in controversy, as it was clear, amid the mass of contradictory testimony filed, that Powell was in the employ of Yost when the invention was made, that the improvement was one ancillary to the preconceived plan of re-organizing the "Climax" machine, for the construction of which machine Powell and other workmen were employed by Yost; and the Commissioner therefore decided, in view of this, that Yost was entitled to use the suggestion of Powell, as to the arrangement of the parts in controversy, even if it is granted that Powell made the suggestion first, which, however, does not appear from the the evidence to be very clearly made out. The Commissioner also decided that Yost and Warner should be considered as joint inventors, as the evidence showed that they were in consultation when the invention was in progress, which the Commissioner considers sufficient to justify their claim, especially in view of their oath, as the office does not undertake to go behind the oath of joint invention, unless it appears from the evidence that such joint invention was impossible.

In the case of R. W. Hamilton's application for a patent for an independent condensing apparatus, the Commissioner decided that in a patent for an apparatus of this character, although an air pump formed one of the essential elements of the combination claimed, the applicant had no right to a claim for such parts as were peculiarly applicable to air pumps, such belonging to a well known sub-division of a different class, and that therefore those features should be claimed in a separate patent.

The Empire Mill of St. Louis having applied for a trade mark, in which the words "snow white" formed a conspicuous part, the examiner rejected the application, and his action was confirmed by the Assistant Commissioner, on the ground that the words were well known and commonly used, as indicating anything very white; and as one of the main indications of the quality of fine flour was its whiteness, it would seem that any one would have the right to apply these words to flour, and that they should not therefore be monopolized.

I find the following in one of our city papers: "It may be remembered that some time ago a Frenchman, by the name of Magin, suddenly sprang into notoriety by announcing that he had discovered a process by which cotton fiber could, by some chemical process, be turned into silk. Among his many propositions was the one—of special interest to the people of Washington—of erecting a mammoth manufactory here, from which the markets of the world could be supplied. In an evil hour he laid his papers and specimens of the manufacture before the examiner at the Patent Office, and applied for a patent. Here his brilliant plans for filling his pockets, and indirectly those of the people of the District, received a check, his papers being returned and his specifications of imitation silk, made by his process, declared to be real silk. Monsieur, with the true French spirit, accepted gracefully the verdict and took his departure for greener pastures. In New York he interested Seligman and others in the scheme, and money was advanced to enable him to go on with the manufacture. It is hardly necessary to say that Magin, as soon as he got hold of the money, decamped, and his whereabouts, despite the careful search of his anxious friends, remained a mystery. But such a man was not born to blush unseen. A little while ago an application was received from England for a patent on substantially the same discovery, and, as if conclusive proof of its worth, the immortal name of Magin was appended as a witness. The application was of course rejected, and Magin once more sinks into obscurity until some new rascality shall bring him into prominence."

The part relating to the first application is substantially correct, but I have been unable to find any corroboration of the statement as to the application said to have been received from England."

PATENT MATTERS IN CONGRESS.

The House of Representatives has passed a resolution directing the Committee on Patents to report a bill to prevent the maintaining of suits against persons who ignorantly purchase articles which infringe upon patents.

Mr. Townsend, from the Committee on Patents, reported a bill to repeal sections 4,924–6–7–8 of the Revised Statutes, relating to extensions of patents, and declaring that it shall be unlawful hereafter for the Commissioner of Patents to renew or extend any patent whatever. He states that the object of the bill was to take away from the statute book sections of the law which were dead and inoperative; but it may be that there is something more in this bill than appears on the face, and it is possible it is part of the general attack that is now being made on our patent system.

The House Committee on Patents have passed a resolution to the effect that they will recommend to Congress no extension of patents, excepting where parties have been "providentially hindered" from enjoying the benefits of their patents.

Both Houses of Congress have agreed to appropriate the money ($45,000) called for by the Commissioner of Patents for repairing the models injured in the late fire in the Patent Office.

The President has sent to the Senate a draft of a treaty for the reciprocal protection of trade marks in the United States and Great Britain, which was signed in London by Lord Derby and Mr. Pierrepoint, October 24, 1877. I have been unable to procure a copy of it, as treaties are not made public until they have been acted on by the Senate, but the following is believed to be a correct synopsis of it:

The subjects or citizens of each of the contracting parties shall have in the dominions and possessions of each other, the same rights as belong to native subjects or citizens, or as are now granted, or may hereafter be granted, to the subjects and citizens of the most favored nation in everything relating to property in trade marks and trade labels. In order to obtain this protection, the manufacturer or tradesman must fulfil the formalities required by the laws of the respective countries.

Mr. Harris of the Naval Committee of the House is preparing a plan for the erection of a new Navy. He proposes to provide for the appointment of a board of competent engineers and naval constructors, whose duty it shall be to superintend the building of this new navy, according to a definite plan. The entire cost is to be $50,000,000, of which $5,000,000 is to be appropriated annually. No further appropriations are to be made for the repair of old vessels where the cost of such repairs would exceed 40 per cent of the original cost of the vessel.

A bill has recently been brought into the House to virtually disband the Bureau of Engraving and Printing at the Treasury, so as compel the department to have all its work done by the bank note engraving companies in New York and elsewhere. This object of this will be fully seen when it is considered that, under the recent re-organization of the Bureau by Mr. McPherson, who has dismissed all superfluous employees, and is running the establishment in business-like fashion, doing all the work possible by piece-work, and so cutting down the expenses that he will have, at the end of the fiscal year, a surplus of about $600,000, the Bureau can and does do work cheaper than the outside establishments, because it has no profits to make. That this is so is shown by the fact that the Treasury advertised for bids for doing certain classes of work, and the Bureau of Engraving and Printing underbid everyone, and the result is that the Treasury pays for printing the backs of notes and internal revenue stamps alone during the present fiscal year, over $109,000 less than it had to pay to the engraving companies for the same work last year.

To secure the importation, free of duty, of all descriptions of raw wool, copper, and copper ore, Mr. Willis, of your city, has introduced a bill providing that no duty shall be levied or collected on these articles after July 1, 1878.

To cater to the anti-Chinese prejudices of the Californian laborers, two bills have recently been introduced, one of which enacts that a capitation tax of $250 shall be levied on every Chinese passenger landed on our shores, and the other forbids vessels taking on board more than ten Chinese, with the intention of bringing them to the United States, under a penalty of a fine of $100 and six months imprisonment for every passenger above ten.

NATIONAL EDUCATION.

The National Education Association is now holding a meeting in this city. Among the questions under consideration are the following: "Measures for strengthening the National Bureau of Education." "The establishment of a National Educational Museum." "The establishment of an Educational Fund by the General Government, and the appropriation of the proceeds of the sales of public lands to school purposes." "A system of national educational statistics." "The best school organization for a State." "The best school organization for a city." "Public high schools,' and "Education for the South." In a paper read by Gen. Eaton, the Commissioner of Education, on "What the General Government has done to aid Education," he stated that the government had given outright nearly 1,000,000,000 acres land and $47,785,177.93 in money. This however, includes what had been appropriated for West Point and the Naval Academy at Annapolis.

THE MISSISSIPPI JETTIES.

The Secretary of War has received an official notification from Captain Brown, the inspecting officer at the jetties, that there is now a practicable channel through the jetties 21 3-10 feet deep at average flood tide; that the only interruption of a practicable channel of 22 feet deep was but 90 feet in length; and that a line of soundings with 22 4-10 feet least depth extends through the bar to deep water.

MUTILATED CURRENCY.

The United States Treasurer has issued a warning against the constantly increasing attempts in various sections of the country to cheat the government and innocent parties by practicing the old trick known as the "piecing" process, whereby a given number of currency notes of similar denomination are cut to pieces and then pasted together, so as to make more notes than there were at first. Ten notes are generally taken, and by adroit piecing, eleven are made. About one tenth is cut off from one end of a note and the large piece passed as it is. Two tenths is next cut from a second note, and the small piece from the first note attached to the large part of the second note; the two tenths pieces are used to replace a three tenth piece cut from a third note; and by continuing this process, cutting off a larger piece each time, eleven notes are made from ten. The makers of these pieced notes do not usually attempt to have them redeemed, but pass them into the hands of innocent parties who have to suffer the loss.

CONSULAR REPORTS.

The United States Consul General at London, in a recent dispatch, refers to the immense trade in American cotton goods that is springing up in England, and states that, "millions of dollars" worth have already been disposed of in that kingdom. He also states that the American manufactures, of what is known as Birmingham wares, more especially agricultural implements, are very favorably regarded in Great Britain and her colonies. With regard to the latter, he believes that it is the superior lightness and finish of the articles, together with the willingness of manufacturers to vary patterns to suit the wishes of the customers, that has brought about the preference for American goods.

The same gentleman, in a previous dispatch, refers to the influx of workmen from the United States to various points in Great Britain, in consequence of a notion spreading among American mechanics that the labor market on the other side of the Atlantic is better than in the United States, which induces many to emigrate with the confident hope of procuring steady and remunerative employment, only to find themselves strangers in a strange land, without either money or work, and no chance of procuring either, unless they have been fortunate enough to make contracts before leaving home, which they can only obtain by taking the work left by some native workmen, who are on a strike. Under these circumstances their money is soon gone, then what clothes they can spare are sold for food, until they appear, half starved and with barely sufficient rainment to cover their nakedness, at the consulates, begging to be sent home, feeling very much surprised and indignant when informed there are no funds in the consul's hands for such a purpose.

FORESTS IN THE UNITED STATES.

To show the necessity of taking some means of protecting our forests, and the need of the Foresting Commission it is proposed to organize, it is stated that within ten years no less than 12,000,000 acres of forest have been cut or burned over in the United States. Much of this timber is used for fuel, twenty-five cities being on record as consuming from 5,000 to 10,000 acres each. Fences use up much timber; and rail

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way sleepers require the product of 150,000 acres per annum. The amount of lumber timber yet standing is no longer large, and but for the fact that it must gradually increase in price, and thus be less wastefully used, it would soon be come so scarce as to be very dear. Nearly $150,000,000 is estimated to be invested in the whole timber industry, employing 200,000 men.

Washington, D. C. OCCASIONAL.

Vulcanized Fibre.

This material is now being manufactured to a considerable extent by a company operating in Wilmington, Del., and it it believed that it will in time assume a place in the arts somewhat akin to rubber or horn, as it is flexible like both, but is without the elasticity of the former, although it may be, like it, manufactured of different degrees of hardness. Several patents connected with its manufacture have been granted of late, and we propose to give a *resumé* of the "state of the art" as exhibited in the records of the Patent Office.

The first patent we find relating to this subject is the English patent No. 787, of 1859, granted to Thomas Taylor, of London, the main idea of which appears to have been to treat paper so that it would be less porous, have greater strength and stiffness, and assume the toughness, semi-transparency, and general appearance of parchment. The process is given by the inventor as follows:

"I take a solution of the salt called chloride or muriate of zinc, and having rendered it as neutral as may be by the addition of oxide or carbonate of zinc, I concentrate the solution, by evaporating it until it has acquired, when cold, the consistence of syrup. In this case it will have the specific gravity of 2100 or thereabout. The solution of zinc being thus prepared, I immerse or float upon its surface the paper to be treated, until it is fully saturated with the solution. The paper is then withdrawn, and the adhering liquor being removed by a scraper, roller, or any other mechanical means, it is either immediately plunged into water or allowed to remain for a short time until it is apparently dry, then plunged into water and washed therein until all soluble matter is removed. In cases where it is desirable to retain a portion of oxide of zinc in the paper, the paper, after being partially washed, is immersed in a weak solution of a carbonated alkali, and afterward thoroughly washed in water. The paper may then be pressed and dried and submitted to the ordinary processes for obtaining a smooth or glazed surface, or it may be sized or colored.

"After this treatment, it will be found that the paper is more or less changed—has contracted in volume, become more dense, and is less porous than before, while at the same time it is much stronger. When, however, it is desired that a more complete change should be produced in the paper, the solution of zinc should be moderately heated before immersing the paper; or the paper, after having been drawn through the cold solution and the adhering liquor removed, should be exposed to a gentle heat, varying from 80° to 90° Fahrenheit to little short of boiling water, according to the effect that is desired to be produced on the paper. In determining the amount of heat to be applied, the kind of paper used, its thickness, density, the strength of the zinc solution, and the length of time during which the paper is exposed to heat, should be considered.

"In general, I find that when ordinary blotting paper is used, and the paper is heated by the application of metallic surfaces, a temperature of 120° to 140° Fahrenheit is sufficient. A good criterion of the completion of the change is to be found in the circumstance that the paper becomes somewhat swollen and apparently dry. It also passes from a semi-transparent and rather rigid state to one that is more opaque and flaccid."

The heating of the paper may be accomplished either by warming the solution of zinc to the required temperature, laying the saturated paper on smooth heated surfaces, or by passing such heated surfaces over the sheets as in ironing cloth. If the paper, however, is in the form of a continuous web, it may be passed between heated rollers or through a hot chamber. The inventor also proposes to dissolve, by the aid of heat, cotton fibre, starch, dextrin, or gum in the concentrated solution of chloride of zinc; and also to add to the solution, prior to using it, the chlorides of tin, calcium, or magnesium; the object of this addition, however, is not stated.

After the sheets of paper have been treated with the solution of zinc they will adhere together, and if a warm iron is passed over them they will become permanently united. In this way sheets of any thickness or size may be formed, or a vessel made so as to be of one piece.

The next patent is that of Aug. T. Schmidt, of Pittsburg, Pa., dated April 4, 1871, which is stated to relate to the treatment of vegetable fibrous substance, whereby they are greatly increased in toughness and strength, rendered impervious to water, capable of resisting the action of most acids and alkalies, and made either firm and hard or soft and pliable, as may be desired. The process may be applied to paper sized and unsized, or to paper pulp, which after treatment may be made into sheets of paper in the ordinary way, or moulded into any desired shape.

The first step of the process is saturating the fibrous substance in a bath of concentrated "mother water," or liquor resulting from the manufacture of chloride of zinc, or of the chlorides of tin, calcium, magnesium, or aluminum. As "mother water" is a waste product not readily attainable in many places, it is stated to be more convenient to produce it for the express purpose from the manufacture of chlorides which are easily manufactured and readily sold. For this purpose metallic zinc is dissolved in dilute muriatic acid, the solution concentrated by heat to about 70° or 75° Baumé, and then cooled, when the solution will deposit crystals of chloride of zinc, which, being removed, leaves the required "mother liquor." To this is to be added sufficient of a solution of chlorine in water to enable the smell of chlorine to be perceived when the liquor is agitated, and enough carbonate of zinc to render the solution neutral.

If the substance to be treated is to be made very opaque, there should be added to the bath as much oxide of tin or zinc as it will retain in solution.

The fibre, if in the form of sheets or rolls, should be passed through a heated chamber or over a hot roller as it enters into the bath, and after passing through the liquor it is pressed between rollers to remove the superfluous liquid, and is then washed in water, which may be made slightly alkaline by the addition of carbonate of soda so as to neutralize any adhering liquor. Paper thus treated may be made of any desired thickness by pressing a number of sheets together as they pass from the chemical bath, or cylindrical objects may be formed by continuous wrapping of paper around a cylinder until a sufficient thickness is formed. Paper pulp or other vegetable fibre may be saturated in the chemical bath and then moulded by pressure into any desired form.

To make from paper, paper pulp or other vegetable fibrous substance, an article having the solidity and hardness of horn or vulcanite, the same bath before described is employed, but concentrated to a strength of about 50° Baumé, or upward, according to the article to be treated. The bath is heated to about 150° Fahrenheit, and the paper or other article, after being first heated and then saturated in the bath, as above described, is passed (on leaving the bath) over or between heated rollers, and then plunged in water, pure or only slightly alkaline, in which it is allowed to remain for from six to twenty-four hours, according to degree of hardness required, after which it is subjected to pressure to solidify it and make it smooth or give it any desired shape. It is then slowly dried at a temperature of from 70° to 80° Fahrenheit. It may be made of any required thickness by bringing together several plies or layers as it passes out of the chemical bath. A still greater degree of hardness may be attained by dissolving in the chemical bath vegetable fiber, dextrine, gum, or starch, and also by sifting on to or between the layers of the paper or fabric, as it passes from the bath, any mineral substance or gum.

A rough texture or surface may be given by sifting emery, powdered glass, sand, or other mineral substance between the layers or on the outer surface, as may be desired, and paper or other vegetable fiber thus prepared may be used for many purposes in the arts. If, on the other hand, it is desired to produce a substance having great flexibility and softness, resembling soft vulcanized rubber without the elasticity of that article, the paper or other fabric is immersed to saturation in the chemical bath in the manner first above described, and then, as it leaves the bath, it is passed over a heated roller of lead (or other suitable material) into a washing vessel containing a weak solution of any suitable alkali in water, and thence into a bath of a solution of water and glycerin in the proportions of two parts, by measure, of water, to one of glycerin, or a solution of sugar and water in similar proportion. This glycerin or sugar bath may be used cold, but it is better to have it heated a little below 212° Fahrenheit. In this bath it should remain about six hours or more, according to the degree of softness required.

Paper thus prepared. and made of suitable thickness by uniting several piles as they pass from the chemical bath, makes excellent belting, the strength of which may be increased by introducing between the layers of paper cloth made of cotton or vegetable fiber, either dry or previously saturated in the chemical bath, as may be preferred; but it adheres better if inserted dry.

In making cylindrical articles by continuous wrapping around a cylinder a condensing roller should be used, so arranged as to give the requisite pressure, and yet allowing a gradual separation as the thickness of the article increases, the roll being heated to from 120° to 200° Fahrenheit; and the cylinder around which the paper, etc., is being wound should be partially immersed in the bath of alkaline solution, or of glycerin and water, or sugar and water, as the case may be.

Fibrous material treated as above described, when of suitable thickness, is extremely soft and pliable, and resembles soft leather in texture, and may be used for many purposes for which leather is employed. When of increased thickness it may be employed for belting, packing, and various other purposes to which soft vulcanized rubber, owing to its great elasticity and its liability to be acted upon by heat and various chemical substances, is inapplicable. By omitting the glycerin or sugar treatment, it may be made as hard as horn and used for various purposes, as it is susceptible of being moulded or otherwise formed into any desired shape.

The article thus produced, whether soft or hard, is not readily combustible, although when exposed to sufficient heat it will burn, but without flame. It may be used to advantage in making hose or pipe for conducting water, gas, and other fluids, and also for the bodies of carriages, railroad cars, or boats, and for various other purposes in the arts and manufactures.

The next U. S. patent is No. 114,880, issued to Thomas Taylor, May 16, 1371, and is precisely the same as his English patent, given above.

On October 3, of the same year, E. S. Hanna obtained a patent on a washer for carriages, machinery, etc., made of this material, which patent was reissued May 20, 1873, No. 5,422.

On the 31st of the same month, D. W. Hanna obtained a patent, numbered 120,380, in which it is stated that from 40 to 90 per cent of the cost of the solution may be saved by continually using the same water for washing the surplus liquor from the paper, until it reaches a gravity of 30° to 40° Baumé, and then evaporating it by boiling until it reaches from 65° to 70° Baumé, at which gravity it may be used for treating the paper instead of the mother liquor before described. When a hard paper is required, nearly all of the solution is washed from the paper, and the saving is greater; but when soft paper is to be made, less of the solution is washed out, and the saving is smaller.

E. S. Hanna obtained a patent February 27, 1872, No. 124,133, for the use of this material as a packing for journal boxes, for which he claims it is peculiarly suitable.

J. H. Savery patented a ferrule for boiler and condenser tubes April 6, 1875. He claims that it has peculiar properties that adapt it to this purpose, as it expands under the influence of either heat or water, and hence will always keep the tubes tight.

The next patent we find is that of R. H. Plass, issued December 19, 1876, covering the use of this material in chair backs and seats.

The President of the Vulcanized Fibre Company, Mr. William Courtenay, obtained two patents on July 24, 1877, Nos. 193,332–3, the first of which is for making tubular articles, such as buckets, measures, cans, drum shells, etc., by taking sheets of vulcanized fiber, chamfering the edges to be joined, and, by immersion in a bath of chloride of zinc, partially dissolving the edges. A tube is then formed with such sheets upon a mandrel of suitable size, and the edges cemented together by heat and pressure, being held by clamps, and heated in any suitable way. The tubes are then soaked in water to extract the surplus chloride, and while still wet are slipped on mandrels, which may be of any desired form, and allowed to dry gradually. The mandrels should be made in sections so as to collapse, because the tubes in drying shrink tightly upon them. The second patent (No. 193,323) is for a can made from a tube formed as above described; but before drying, the edges of its ends are turned over by hand so as to form beads or flanges, after which it is slowly and carefully dried. If preferred, the beads or flanges may be strengthened by being turned over a wire or a narrow band of the vulcanized fiber. A bottom of the same or other material is to be set in place and secured in any convenient way.

In the patent No, 196,894, issued to Thompson Hanna, November 6, 1877, it is stated that the vulcanized fiber has a slight tendency to absorb moisture, but that this may be overcome by subjecting the manufactured article from 24 to 48 hours to a bath of strong nitric acid, or a mixture of nitric and sulphuric acids, or one of sulphuric acid and nitrate of potash, or a vapor bath of the fumes arising in the manufacture of bisulphate of potash, by which the material is rendered almost absolutely impervious to water.

The patent No. 196,894, issued to the same gentleman on the same day as the last, covers another process for saving the chloride of zinc which is washed out of the fiber, in which the washing liquid, instead of being evaporated, is treated with sufficient of a solution of carbonate of soda to cause a complete chemical reaction, the result being carbonate of zinc is precipitated and chloride of sodium remains in solution. The advantage this process has over evaporating is that the precipitated carbonate of zinc commands a high price and is worth as much or more than the original cost of the solution, by which means the paper or fiber is treated with very little cost. The carbonate may be sold for other uses, or may be employed again in treating fiber, by dissolving it with hydrochloric acid. Carbonate of potash or any other alkaline carbonates may be used instead of the carbonate of soda.

The last patent issued in this connection is No. 197,252, granted to Mr. Courtenay, November 20, of this year, which covers the use of vulcanized fiber for the sounding boards of musical instruments, for which purpose it is said to be peculiarly well adapted, as atmospheric changes have very little effect upon it, and sounding boards made from it are not likely, therefore, to split or warp.

Inventions Patented in England by Americans.

From October 9 to November 20, inclusive.

MERCURY MOTOR.—T. A. Shinn, Pittsburg, Pa.
PATTERN CARDS FOR EMBROIDERY.—T. E. Parker, Mass.
PAINT MILL.—T. W. Masury, Brooklyn, N. Y.
PAINT CAN.—T. W. Masury, Brooklyn, N. Y.
PIANOFORTE.—C. E. Rogers, Boston, Mass.
PLOW.—I. E. Holmes, Washington, D. C.
PLOW, ETC.—T. Bond, New York city.
RAILWAY SIGNAL.—F. W. Eames, Watertown, N. Y.
ROOFING.—P. Pierce *et al.*, Brooklyn, N. Y.
ROLLER SKATES.—R. Hutton, Brooklyn, N. Y.
ROTARY PUMP.—T. H. Asbury, Philadelphia, Pa.
SASH FASTENER.—R. H. Rose, New York city.
SEWING KNIT FABRICS.—W. Pearson, Philadelphia, Pa.
SEWING MACHINE.—J. E. A. Gibbs, Steel's Tavern, Va.
SHOE FASTENING.—J. S. Hall, San Francisco, Cal.
SHOE CRIMPING.—Philip Fisher Shoe Company, New York city.
SHUTTLE FASTENER.—T. B. Rogers *et al.*, New York city.
SPOOL PRINTING MACHINE.—A. C. Gould *et al.*, Boston, Mass.
SURGICAL INSTRUMENT.—J. C. Allen *et al.*, Buffalo, N. Y.
SUBMARINE TORPEDO.—H. T. Brown, New York city
SUGAR-CUTTING MACHINE.—W. Jasper *et al.*, San Francisco, Cal.
TIME DETECTER.—W. W. Le Grande, Louisville, Ky.
WATER FILTER.—F. Wallrouth *et al.*, New York city.
WATER MOTOR.—O. J. Backus, Newark, N. J.
WOOD, TREATING.—Ira Hayford, Boston, Mass.

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Business and Personal.

The Charge for Insertion under this head is One Dollar a line for each insertion.

T. P. Pemberton, 37 Park Row, Room 30, New York. Machinery and Inventions illustrated and described.

Murtagh's Dumb Waiters, Hoisting Machines, and Invalid Safety Elevators. of approved patterns. Isaac Richards, 2,217 Chestnut St., Philadelphia, Pa.

Magic Lanterns, Sciopticons, Stereopticons and Views. The best at lowest prices. Illustrated catalogue, 140 pages, 10 cts. Second-hand catalogue. 10 cts. Circulars free. Theo. J. Harbach 809 Filbert St., Philadelphia, Pa.

Wanted.—A First-class Foreman to take charge of a very extensive Machine Shop and Foundry. Address P. O. Box 2,307. Philadelphia, Pa.

For the best Bone Mill and Mineral Crushing Mach nes, address Baugh & Sons, Philadelphia, Pa.

See Advertisement of Sale at Auction of Foundry and Machine Works, with established business, at Toledo, Ohio, on page 13.

Wanted—To Correspond with the Manufacturers of Furnaces, and other apparatus, required for the manufacture of fine Glass, also a Glass Maker thoroughly acquainted with the business. Address T. A. Willson & Co., Reading, Pa.

Variety Self Centering Chuck. See illustration, page 406, June 30, 1877. Patent for sale, or the inventor will receive proposals to manufacture on royalty. Address Wm. Frost, 48 County street, New Bedford, Mass.

Agents both Men and Women are doubling their money, selling new and useful Household patents for L. E. Brown & Co., 242 Elm Street., Cincinnati, O. Write them for Terms.

Friction Clutches warranted to save Rolling Mill Machinery from breaking. Also Hoisting Machines and Safety Elevators. D. Frisbie & Co., New Haven, Conn.

The Penfield Block Works, Lockport, N. Y., want a second hand platform scale on wheels; capacity about 2,000 lbs. Must be cheap.

Silk-Draming and Denering Machines, manufactured by Norris & Co., Steam Gauge Makers, Paterson, N. J.

Vertical Scientific Grain Mills. A.W.Straub & Co., Phila.

Yacht Engines. Complete with Boiler from $75 upwards. Geo. F. Shedd, Waltham, Mass.

Manufacturers should try the pure natural Lubricatin oil. Produced and prepared by Geo. Allen, 13th street, Franklin, Pa. It does not gum or chill in cold weather, and wears as well as lard oil. Price by the barrel 30 cents per gallon. Packages of 10 gallons sent on receipt of $3.75.

Second-hand Iron Plane built by Smith of Salem. Planes 13 ft. x 30 in.; price $375. A. C. Stebbins, Worcester, Moss.

Lipsey "Reliable" Wrench; strong, convenient. Best. Roper Caloric Engine Manuf. Co., 91 Washington St., N.Y.

Ice Machines. Clayton & Cook, Daretown, N. J.

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Machine Diamonds, J. Dickinson, 64 Nassau St., N. Y.

Caution to the Public.—To avoid imposition, purchasers of Waltham Watches will observe that every genuine watch, whether gold or silver, bears our own trade mark on both case and movement. Gold cases are stamped "A. W. Co.," and guarantee certificates, signed Robbins & Appleton, accompany them. Silver cases are stamped "Am. Watch Co., Waltham, Mass., Coin Silver," or "Am. Watch Co., Waltham, Mass., Sterling Silver," according to quality, and are accompanied by guarantee certificates, signed R. E. Robbins, Treasurer. The name "Waltham" is plainly engraved upon all movements, irrespective of other distinguishing marks. This caution is rendered necessary by reason of the fact that our cases are frequently separated from our movements and put upon worthless movements of other makers, and *vice versa*, thus affecting injuriously the performance of the watches. Every buyer should make a close inspection, as indicated. Amer can Watch Company, by R.E. Robbins, Treasurer.

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To Millwrights and Parties in want of Engines, Boilers Shafting, Gearing Pulleys, etc., upon receipt of specifications we will give you promptly bottom prices for same. B. W. Payne & Sons, Corning, N. Y.

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More than twelve thousand crank shafts made by Chester Steel Castings Co. now running; 8 years constant use prove them stronger and more durable than wrought iron. See advertisement, page 14.

"Little All Right," the smallest and most perfect Revolver in the world. Radically new both in principle and operation. Send for circular. All Right Firearms Co., Lawrence, Mass., U.S.A.

For Solid Wrought Iron Beams, etc., see advertisement. Address Union Iron Mills, Pittsburgh, Pa., for lithograph, etc.

Felt of every description for Manufacturers' purposes, especially adapted for Polishing, can be furnished in any thickness, size, or shape. Tingue, House & Co., Manufacturers. Salesroom, 69 Duane St., N. Y. Factory at Glenville, Conn.

Notes & Queries

(1) F. P. asks how to transfer engravings or rather pictures cut from newspapers to glass, for use as magic lantern slides? A. Photography is, we believe, the only satisfactory means. A glass negative of the picture is at first taken, and from this a positive photograph on the lantern slide.

(2) T. Y. R. asks for a process by means of which corkwood can be bleached? A. It is whitened by boiling in hydrochloric acid: or use a strong solution of chloride of lime (bleaching powder) slightly acidified with sulphuric acid. The fumes of burning sulphur, in the presence of moisture, will also answer in some cases.

(3) B. S. asks for a recipe for the so-called diamond cement? A. Soak isinglass in water till it is soft, then dissolve it in the smallest possible quantity of proof spirit by the aid of a gentle heat. In 2 ozs. of this mixture dissolve 10 grains of ammonicum, and while still liquid add half a drachm of mastic dissolved in 3 drachms of rectified spirit, stir well together and bottle. For use the bottle is placed in warm water: and as soon as the contents liquefy use immediately.

(4) J. B. asks: How many feet of No. 40 silk insulated wire do I want to make the electric magnet illustrated in telephone in vol. 37, No. 14? A. Two ozs. of No. 40 (Brown and Sharpe's gauge) copper wire, silk insulation.

(5) H. T. wishes to know the value and power of the Trouvé moist battery? A. It would require five of them to equal the electro-motive force of one cup of Grove's battery.

How high will water rise in a pipe after all the air is withdrawn? A. About 32 feet, more or less, according to the condition of the atmosphere.

(6) E. H asks: Why has the brain of a person an uneven surface? A. The greater the number of convolutions the greater is the amount of gray substance and hence the greater is the physiological power of the brain.

What are the functions of the spleen? A. Unknown.

Would you advise anything to be applied to the hair (when in good order) except the dry brush and comb? A. No.

(7) J. E. B. inquires: What can I use to coat the barrel of an English rifle, to keep it from rusting? A. Have it plated with nickel, and if the surface is too bright, rub it with chamois leather, moistened with a paste of water and pulverized pumice.

(8) A. B. asks: What is the best way of pickling the castings to get the scale off? A. We have used a pickle of 1 gallon of cold water and 2 ozs. of sulphuric acid, and find that it is inexpensive, and does the work perfectly; the castings must be free from grease or oil, and should be pickled until the scale will wash off, which will take from one to ten hours. 2. Is there anything that will destroy sulphuric acid so that the dust of the pattern in filing will not hurt the eyes? A. Thoroughly wash the pickled castings in cold water and then leave them over night in lime water.

(9) C. B. R. writes: 1. Would Mr. Trouve's new moist battery, mentioned on pp. 323 of SCIENTIFIC AMERICAN do to run a sewing machine? A. Yes. 2. If so, how many cells would it require to take the place of four Bunsen cells? A. About twenty cells.

(10) P. P. asks: How is aerated bread made and is the process patented? A. It is made by forcing carbonic acid gas under pressure into the dough. For illustrations of machinery used see "Knight's Mechanical Dictionary."

(11) G. D. asks: Will you explain in your next issue the proper way of getting the pitch line of cogs? A. The pitch line is at the junction of the flank and face of the tooth and may be marked therefrom.

(12) S. M. H. asks if phosphorus can be made luminous in an airtight bottle, and if there is any substance which is luminous under these conditions? A. If pure air and moisture are present in the bottle the phosphorus will continue, for a time, to glow when seen in the dark. We do not know of a simple substitute for the phosphorus. A coil of fine platinum wire sealed in a bottle may be made to glow brilliantly by the passage of a strong electric current.

(13) W. M. asks for a recipe for preserving eggs? A. Mix ½ pint of unslaked lime with the same quantity of salt, and a couple of gallons of boiling water. When cold put in the eggs, see that they are well covered with the water, and the vessel containing them kept in a cool place. The eggs should be fresh when put in, as one bad one will spoil all.

(14) C. S. asks for a solution of the following problem, namely: The center of the circle is in the circumference of another circle; what must be the radius of the first circle in order that its area shall include the area of the second circle? A. Calling x half the arc in degrees, cut from the given circle by the the other, and π the ratio of the diameter to the circumference, the area cut from the given circle $= \left(1 - \cos. x + \frac{x \cos. x}{180}\right)\pi - \sin. x$. If you find x for any given case, which can be computed by approximation from the above formula, the required radius = 2 sin. ½ x. You will find a demonstration of the above formula, with an example of its application, in Robinson's "Mathematical Operations."

(15) D. R. P. asks: Could you please inform me what a good engraver can earn? A. From $50 to $150 per week.

1. Is there any way of keeping India ink in a liquid state for printing and marking with a brush? A. You can buy it in a liquid form, but as when mixed with water it must be kept from air. 2. How can I make a good red ink that will be bright and shiny for the same purpose? A. Cochineal dissolved in ammonia makes an excellent red ink.

(16) S. B. G. asks: How do spiders get the first thread of their webs across between the supports? A. Very frequently they let the wind blow a thread across, which they afterwards strengthen. They are also said to swing across occasionally.

1. How does the outside wheel of a car get round on the outside rail of a short curve without making more revolutions than the inner wheel, or without slipping on the track? A. It does not unless the wheel is coned so that it runs on a portion sufficiently enlarged.

1. Which has the greater range, a short barreled rifle or a long one, each being equal as far as the bar, etc., is concerned? A. Up to certain limits, an increase in length generally produces increased range. 2. Which will shoot the harder, a gun which is patched so tight that no air can pass around the ball, or one which is not patched so tight? A. The first, generally.

(17) J. S. asks for a solution to put on cloth for covering hams to keep flies away? A. Dip in solution of sodium acetate, and, after sewing up, in thin milk of lime.

(18) F. L. B. writes: The process of printing pictures from prints, given on p. 343, No. 22, present volume, does not produce the desired effect for me. The ink takes on the paper about the same where it is blank or where it has been printed. What is the reason? A. Try again, your solution is either too strong or too weak; or your roller may have too much ink on it; all the processes of transfer require delicate manipulation

(19) H. H. asks whether every engineer that is running a stationary engine in this city must have a license? A. Yes. You can get full particulars at Police Headquarters, 300 Mulberry street.

(20) R. S. N. writes: Please advise me what will prevent the foaming of water in boilers? A Examine the inside of your boiler; it may be incrusted with scale.

(21) L. M. D. asks: 1. Is there such an article as liquid paraffin? A. It is an oil used in England for illuminating purposes; and is a product resulting from the destructive distillation of coal, and from which paraffin may be crystalized by extreme cold. 2. What effect will it have on flowers? A. It is indirectly a vegetable product and might be useful as a fertilizer. 3. What will prevent the leaves of house plants from losing their greenness? A. Sunlight, good earth, and good culture.

(22) J. E. G. asks for a cheap composition resembling silver? A. Tin 3 ozs., copper 4 lbs.

(23) J. H. B. says: I wish to warm a bath room 6 feet x 9, and cannot get a furnace pipe to do it without spoiling the look of the room underneath. I propose to make a coil of brass pipe ⅞ inch outside, 6 feet long, containing 60 feet in all, and using hot water from bath boiler and returning to boiler through circulating pipe, in the same manner as I would run hot and circulating pipes to bath tub. Will this give enough heat for bathing purposes? A. Your plan should succeed, provided a good circulation is secured by means of pipe of large size—this latter requirement being very necessary in heating by hot water.

(24) C. F. H. writes: I have a lot of coke taken from a gas retort. Will you please inform me how I can work it up for carbon for a battery? A. Cut it into slices with a hand saw, or with a circular saw running at a slow speed.

(25) W. B. G. says: My open grate draws nicely. Have lately gone into the room above and cut a hole into same flue and put up a stove in said upper room, with pipe leading into same hole. Stove also has good draft when there is no fire in grate. But when there is fire in grate there is not only no draft to stove but there is a reverse draft through it, so that the smoke and gas from the grate fire fill the upper room and house. Can you indicate a remedy? A. It is a bad plan to introduce a pipe into a flue already appropriated by another fire. However, where it is unavoidable, there should be a piece of sheet iron or cast iron plate inserted vertically in the flue, dividing it into two separate flues for about two feet above the point where the pipe enters it, the bottom being shut off to that part of the flue used by the pipe.

(26) B. F. A. and C. A. K. ask for a simple copper dip or wash? A. Wash the articles clean and dip in rain water 3 lbs., sulphate of copper 1 lb.

(27) S. G. asks: 1. What is best to put on tin roofs and gutters that will be perfectly harmless to cistern water? A. Rochelle ocher is a very clean paint for tin roofs, and is not very likely to be deleterious to water. 2. Do you think it is best to have a second filter (the water entering the same at the bottom and being drawn off for use at the top) in a cistern where it is likely that a heavy rain going through the first filter would wash all the sediment into the cistern? A. It is usual to let the rain water fall into the cistern first and there settle, by which means it is much cleared before passing through the filter. The first filter will not in that case be required. 3. What cement is the most free from taste, or what will cover cement to prevent its tasting? A. There is not much choice in that respect. The application of water glass might cover it.

(28) H. S. asks whether any solid or liquid has a marked affinity for hydrogen over oxygen? A. No.

(29) C. O. says: I have some manilla silk drawers dyed with indigo of different shades. After repeated washing the color still rubs off. What will prevent it and set the color? A. Boil the goods in 4 ozs. alum and 1 oz. cream of tartar dissolved in 3 gallons pure water, expose to the air for some time, boil in fresh water, and repeat the airing.

(30) A. C. L. asks how to make a japan for iron? A. 1. Mix shellac varnish with a sufficient quantity of ivory black or lamp black. 2. Asphaltum 1 lb., melt, then add hot balsam of capivi, and thin with turpentine. 3. Grind lampblack very smooth and add copal varnish to the proper consistence. 4. Asphaltum 3 ozs.; boiled oil, 4 quarts; burnt umber, 8 ozs.; mix by heat, and when cooling thin with turpentine. 5. Amber, 12 ozs.; asphaltum, 2 ozs.; fuse by heat and add boiled oil ½ pint, resin 2 ozs.; when cooling add 1 pint of turpentine.

(31) In answer to Z. T.—The liquor from the lower part of the cesspool will be richer in nitrogenous fertilizers.

(32) T. B. asks how to keep the rubber on babies' nursing bottles sweet? A. Wash in pure water after every use; nothing else answers as well.

(33) E. C. N. writes: 1. I wish to make a permanent magnet? A. See answer to No. 40, p. 283, of the issue of November 3, 1877, and to No. 16, p. 299, of the issue of November 10, 1877. 2. Will sulphate of copper and oil of vitriol work well in a battery together? A. Yes, if the battery is formed of a copper tank containing an inner frame of zinc.

(34) D. W. S. asks: How can I clean the dial of a clock, the enamel of which has become soiled from winding? It will not rub off. A. Try a little benzole, quickly applied. Soap and water will often suffice.

I have a medal which I think is pewter; through age it has become coated with a hard black substance. What will remove it? A. Dissolve 1 oz. of sal soda in a quart of water and boil the alloy in this for a few minutes. Rinse with water and then with strong muriatic acid, again with a little water, and rub in soft sawdust and finally in whiting.

(35) C. M. S. asks how to bronze inks, gold, silver, or any kind? A. Gold ink—Triturate fine gold leaf with a little honey, dissolve out the honey with hot water, and mix the gold powder with a sufficient quantity of gum water. Or use (with a gold pen) a strong solution of gold chloride in ether. For silver, use silver bronze powder or mica dust suspended in gum water. For bronze inks use any of the bronze powders in a like manner. It is necessary that the powders used should be very fine.

(36) I. M. asks: What is a good substitute for copperas in coloring fur felts black? A. The following, although not so cheap as the copperas vat, yields a rich, permanent black: Cam wood 8 per cent (8 parts for every 100 of goods). Boil 50 minutes. Then add bichromate of potash, 3 per cent; alum, 1 per cent; argol, 1 per cent. Boil 50 minutes and age over night. Then boil for an hour and a half in logwood 45 per cent; fustic, 8 per cent; sumac, 4 per cent; water, q. s.

(37) P. R. asks how to prepare thin brass that is exposed to an alcohol flame so as to keep a nice surface, not particular about what color? A. You may try the following: Into a suitable quantity of strong water glass solution mix 10 parts black oxide of copper and 20 parts graphite, both ground to a floury powder, and 1 part of Prussian blue dissolved in a very small quantity of a saturated solution of ferro-cyanide of potassium. Heat this and dip it uniformly on the clean work. When dry, brush.

(38) R. P. D. asks if lime placed in a room where polished steel goods are stored, the goods being in paper packages, will have a tendency to prevent rust? A. Caustic lime desiccates the air immediately surrounding it, thus preventing rust. A few tablespoonsful of the powder will suffice for an ordinary show case. It must be renewed occasionally. It is incapable of injuring the goods.

(39) J. J. J. asks for recipes for dyeing blue and dark blue on woolen goods? A. Pale blue—For 50 lbs.: 1 gill sulphuric acid, 3 ozs. extract of indigo, 1 lb. alum. Enter cold with one half of the extract, give the other half when the boiler warms, bring to the spring. Dark blue: Give the goods a mordant of tartar; lift, add a little chromate of potash, again work 15 or 20 minutes, and rinse: next boil in a bath of logwood, adding towards the last a few grains more of the chromate, again boil and finish. The whole quantity of chromate used should not exceed ¼ oz. to each lb. of logwood taken for the bath.

(40) D. W. J. says: I want to preserve some large insects, such as tarantula, and small animals such as field mice. Can I preserve their shape and color without putting them in a liquid? A. For spiders, puncture them and steep for several days in a strong alcoholic solution of pure phenol, and then in dilute alcoholic glycerin. Or use a saturated solution of salicylic acid in glycerin: dry carefully. Small animals are best treated by the ordinary taxidermic methods—by removing the intestines, brains, etc., and curing the

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tissues by treatment with strong solution of alum and salt, and filling with cotton charged with a little corrosive sublimate, arsenious acid, etc., after drying.

(41) C. W. R. says: Will you please inform me how the elevated street cars in New York are propelled? A. They are drawn in the usual way by small locomotives.

(42) J. S. S. asks where the extra weight comes from when wood petrifies or turns to stone? A. Silica (sand) is dissolved by alkaline solutions. Hence all natural waters which contain alkaline carbonates hold also in solution a little silica. If wood be present in such waters, as it decays the particles of silica are deposited in place of those that escape, and thus a copy of the wood in stone, or a petrifaction, is produced.

(43) T. N. & Co. say: We have been unsuccessful in an attempt to prepare the varnish recommended on p. 316, current volume. We used benzine and naphtha. A. Use ordinary wood naphtha—benzine was a mistake.

(44) T. T. W. asks: 1. What is the best point of cut-off for a stationary engine? A. That is dependent on the size of the engine, the work to be done, and the quantity or pressure of steam to do it with. The proper point of cut-off is that at which the most work can be obtained from a given quantity and pressure of steam, and is best found by a direct test. 2. Did you ever know of an engine cutting off at ¼ stroke and allowing ¾ expansion? A. It is practicable to cut off at ¼ stroke if the engine is very large as compared with the boiler and the work to be done; but the steam must be of high pressure; what it lacks in quantity must be made up in tension or pressure.

(45) L. J. O'C. asks: 1. Is there any method of bleaching resin? A. Common resin (colophony) dissolves readily in hot spirit of wine or methylic spirit in oil of turpentine, benzine, and the essential oils, and in alkalies. It cannot be readily bleached. 2. What is the coloring matter in resin? A. Several resinoid acids. 3. What causes resin to smoke when burning? A. The want of a sufficient supply of oxygen to consume all of the carbon. 4. Is there anything to prevent it from smoking when burning? A. Yes; an adequate supply of air or oxygen. 5. Is there anything I can put in rosin to give it a white appearance that will not prevent it from burning? A. Melt it with sufficient chalk or sulphate of barium.

(46) In answer to W. F. who asks for information concerning liquid solder: By fusing the tin and bismuth together, with a little charcoal powder, and adding the mercury when nearly cooled, a very fusible alloy may be obtained, which, although not very well suited for a solder, might be useful in some cases. For soldering delicate work the following has been successfully used: 8 parts bismuth, 5 parts lead, 3 parts tin, melt: pour this into a mortar with some boiling water and rub it with a pestle as the water cools. This will produce a fine powder. The parts to be soldered are cleaned with a drop of acid zinc chloride, covered with the powdered solder, pressed together and immersed for a time in pure boiling water, which fuses the solder.

(47) J. W. P. writes: In your last issue you give for varnishing chromos to use map varnish with a size. Please tell of what, and how the varnish and size are made? A. Zinsser's spirit copal gives perhaps the best results. Use the varnish quite thin, flowing it quickly over the surface. When the first is dry, another coat may be applied if desired.

(48) R.. B. T. writes: We have been building a house in which a balloon frame was put up and sheeted inside with matched hemlock sheeting, not seasoned. As soon as the siding was put on, and before it got wet in any way, the first coat of paint was put on, and plenty of time given for drying before second coat was put on; then a much longer time was allowed before the third and last coat was applied. We now find great blisters as large as a man's hand in some places. Would the moisture of the plaster pass through the sheeting and penetrate the siding, which is separated from sheeting by a space of 4 inches? A. The cause of the blistering is no doubt to be found in the absorption of water by the siding boards upon the inside, which water, being expanded into vapor by the heat of the sun and confined by the film of oil, separates the paint from the wood. 2. Can you tell us something of the manufacture of paint tubes, which are made of some flexible metal so that the paint can be pressed ont at the opening? A. They are made of lead closed at bottom by folding over into a seam by pressure, and the top closed with a cap screwing on the tube—the whole formed by pressure. Those we have seen are patented and manufactured in France. The cost of manufacture cannot be great.

(49) E. F. asks: How thick is a bound volume of the SCIENTIFIC AMERICAN? A. About 1¼ inches.

I have two lenses (double convex) of 2¼ inches focus. Can I make a camera obscura of them, and how? I would like an image as large as 18 inches in diameter, and as much from the lenses. If these lenses will not do, what lenses do I need? A. No. You will require a lens of from 12 to 20 inches focus.

What is the best way to preserve chicken meat for use where the fresh article is scarce or expensive? A. Ice packing the clean meat is perhaps the best under ordinary circumstances. Immersed in water containing about seven grains of salicylic acid to the pint, it will keep some time.

(50) I. G. L. writes: Is there not a certain percentage of loss of power in cushioning an engine? I understand that it makes an engine run smoothly and stops thumping, but think it does so at a loss of power. A. You are right.

(51) W. T. W. writes: 1. Please tell me how much coarse copper wire does it take to make a pair of Bell telephones, same size as illustrated in SCIENTIFIC AMERICAN of October 6, 1877, No. 14? A. Four ozs. of No. 40. 2. Is it necessary the copper should come in direct contact with permanent magnet? A. It must not. 3. What are the collars made of that hold the copper wire in place? A. Wood, or hard rubber. 4. How can I make a permanent magnet? A. See answer to No. 40, p. 283, and No. 16, p. 299. 5. Is it necessary that the magnet should be movable so as to adjust the same as a relay? No.

(52) E. W. writes: Is it necessary to magnetize both ends of the bar magnet of the telephone so as to have a North and South pole, or would the magnetizing of one end affect both ends? A. If magnetizing by contact with a magnet, it is well to magnetize both ends of the bar (but of course with different poles of the magnet) but even if you only magnetize one end of the bar, say with a north polarity, the other end becomes south by induction.

How do taxidermists preserve the lips, feet, and very fleshy parts of animals where those parts cannot be removed or the skin taken off so as to remove the cartilaginous substance from underneath? A. Various preserving chemicals are used, principally arsenic or arsenical soap.

Has the moon anything to do with blindness in horses? A. No.

(53) N. S. B. asks (1) the size of the magnet used in the telephone described in No. 14, vol. 37? A. The drawing is of the working size. 2. Also, the manner of coiling the wire? Is it insulated from the magnet and the separate layers from each other? Is the coil fastened securely to the magnet, or does the magnet slide through the coil? What is the number of the wire and the number of feet used? A. The spool may consist of 2 ozs. of No. 40 copper wire covered with silk; this wire is wound on the magnet in the same manner that a spool of cotton is wound. It is well to first wrap the magnet with one layer of paper.

COMMUNICATIONS RECEIVED.

The Editor of the SCIENTIFIC AMERICAN acknowledges with much pleasure, the receipt of original papers and contributions upon the following subjects:

On the Practical Utilization of Natural Gas. By E. N.

On Tobacco, and its Chemical Ingredients. By H. D. T.

HINTS TO CORRESPONDENTS.

We renew our request that correspondents, in referring to former answers or articles, will be kind enough to name the date of the paper and the page, or the number of the question.

Correspondents whose inquiries fail to appear should repeat them. If not then published, they may conclude that, for good reasons, the Editor declines them. The address of the writer should always be given.

Inquiries relating to patents, or to the patentability of inventions, assignments, etc., will not be published here. All such questions, when initials only are given, are thrown into the waste basket, as it would fill half of our paper to print them all; but we generally take pleasure in answering briefly by mail, if the writer's address is given.

WANTS AND BUSINESS INQUIRIES.

Almost any desired information, and that of a business nature especially, can be expeditiously obtained by advertising in the column of "Business and Personal," which is set apart for that purpose subject to the charge mentioned at its head.

We have received this week the following inquiries, particulars, etc., regarding which can probably be elicited from the writers by the insertion of a small advertisement in the column specified, by parties able to supply the wants:

Who makes cushioned emery wheels?

What are the merits of the Wardwell sewing machine?

Who makes an indelible tracing pencil for woolen or cotton goods?

Who makes a small machine for cutting lines straight or at any angle, for producing plates for embossing on book covers, or for small die work?

OFFICIAL.

INDEX OF INVENTIONS

FOR WHICH

Letters Patent of the United States were Granted in the Week Ending

November 20, 1877,

AND EACH BEARING THAT DATE.

[Those marked (r) are reissued patents.]

A complete copy of any patent in the annexed list, including both the specifications and drawings, will be furnished from this office for one dollar. In ordering, please state the number and date of the patent desired, and remit to Munn & Co., 37 Park Row, New York city.

Anchor tripper, J. P. Dorr, Jr. ... 197,348
Auger, earth, W. H. Yarborough ... 197,445
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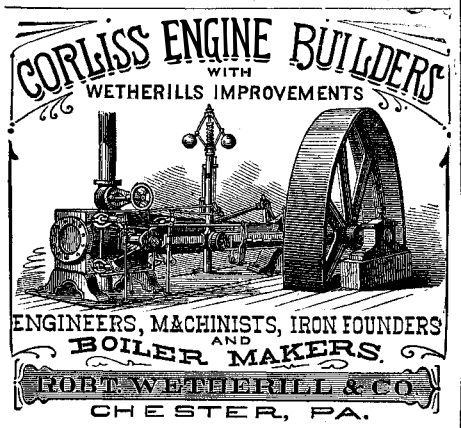

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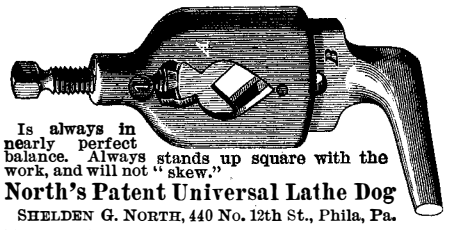
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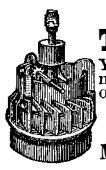
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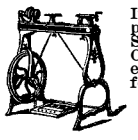
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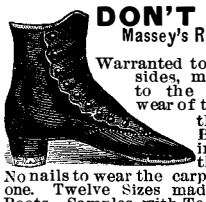
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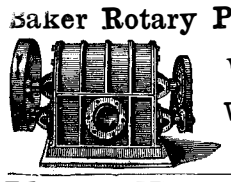
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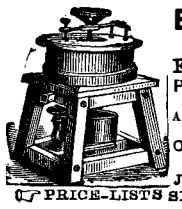
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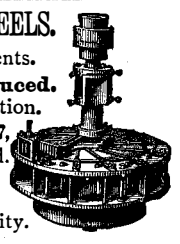

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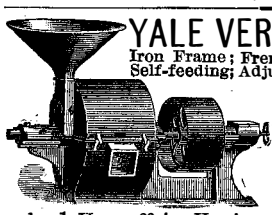

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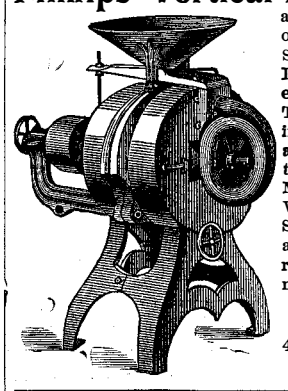

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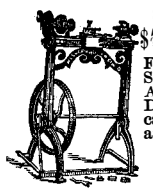

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